Government
Publications

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Ontario. Legislature assembly.

Sessional papers.

101

SESSIONAL PAPERS.

VOL. XLIV.—PART IX.

FIRST SESSION

OF THE

THIRTEENTH LEGISLATURE

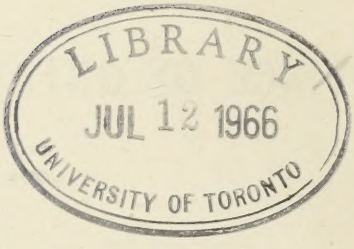
OF THE

PROVINCE OF ONTARIO.

SESSION 1912.

TORONTO:
Printed and Published by L. K. CAMERON, Printer to the King's Most Excellent Majesty
1912

Printed by
WILLIAM BRIGGS,
29-37 Richmond Street West,
TORONTO



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No. 2 — Estimates—Supplementary for the service of the Province for the year ending 31st October, 1912. Presented to the Legislature, 26th February and 28th March, 1912. *Printed.* Estimates for the year ending 31st October, 1913. Presented to the Legislature, 1st April, 1912. *Printed.*

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No. 4 — Report of the Bureau of Mines, for the year 1911. Presented to the Legislature, 15th March, 1912. *Printed.*

No. 5 — Report of the Inspector of Division Courts, for the year 1911. Presented to the Legislature, 1st March, 1912. *Printed.*

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No. 9 — Report of the Commissioners for the Queen Victoria Niagara Falls Park, for the year 1911. Presented to the Legislature, 18th March, 1912. *Printed.*

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No. 18 Report of the Secretary and Registrar of the Province, for the year 1911. Presented to the Legislature, 2nd April, 1912. *Printed.*

No. 19 Report upon the Registration of Births, Marriages and Deaths, for the year 1910-11. Presented to the Legislature, 1st March, 1912. *Printed.*

No. 20 Report of the Provincial Board of Health, for the year 1911. Presented to the Legislature, 1st March, 1912. *Printed.*

No. 21 Report on the Hospitals for the Insane, for the year 1911. Presented to the Legislature, 18th March, 1912. *Printed.*

No. 22 Report on the Hospitals for Idiots and Epileptics, for the year 1911. Presented to the Legislature, 18th March, 1912. *Printed.*

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No. 26 Report upon Neglected and Dependent Children, for the year 1911. Presented to the Legislature, 22nd March, 1912. *Printed.*

No. 27 Report upon the Operation of the Liquor License Acts, for the year 1911. Presented to the Legislature, 3rd April, 1912. *Printed.*

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No. 28 Report of the Department of Agriculture, for 1911. Presented to the Legislature, 2nd April, 1912. *Printed.*

No. 29 Report of the Agricultural College and Agricultural Farm, for the year 1911. Presented to the Legislature, 3rd April, 1912. *Printed.*

No. 30 Report of the Ontario Veterinary College, for the year 1911. Presented to the Legislature, 2nd April, 1912. *Printed.*

No. 31 Report of the Ontario Agricultural and Experimental Union, for the year 1911. Presented to the Legislature, 3rd April, 1912. *Printed.*

No. 32 Report of the Fruit Growers' Association of Ontario, for the year 1911. Presented to the Legislature, 2nd April, 1912. *Printed.*

No. 33 Report of the Fruit Branch of the Department of Agriculture, for the year 1911. Presented to the Legislature, 2nd April, 1912. *Printed.*

No. 34 Report of the Ontario Vegetable Growers' Association, for the year 1911. Presented to the Legislature, 3rd April, 1912. *Printed.*

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No. 36 Report of the Entomological Society of Ontario, for the year 1911. Presented to the Legislature, 2nd April, 1912. *Printed.*

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No. 38 Report of the Dairymen's Associations of Ontario, for the year 1911. Presented to the Legislature, 3rd April, 1912. *Printed.*

No. 39 Report of the Live Stock Associations of Ontario, for the year 1911. Presented to the Legislature, 22nd February, 1912. *Printed.*

No. 40 Report of the Farmers' Institutes of Ontario, for the year 1911. Presented to the Legislature, 22nd February, 1912. *Printed.*

No. 41 Report of the Women's Institutes of Ontario, for the year 1911. Presented to the Legislature, 22nd February, 1912. *Printed.*

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No. 42 Report of the Horticultural Societies of Ontario, for the year 1911. Presented to the Legislature, 3rd April, 1912. *Printed.*

No. 43 Report of the Agricultural Societies of Ontario, for the year 1911. Presented to the Legislature, 22nd February, 1912. *Printed.*

No. 44 Report of the Bureau of Industries, for the year 1911. Presented to the Legislature, 2nd April, 1912. *Printed.*

No. 45 Report of the Inspectors of Factories, for the year 1911. Presented to the Legislature, 2nd April, 1912. *Printed.*

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No. 46 Report of the Temiskaming and Northern Ontario Railway, for the year ending 31st October, 1911. Presented to the Legislature, 22nd February, 1912. *Printed.*

No. 47 Report of the Hydro-Electric Power Commission, for the year 1911. Presented to the Legislature, 11th April, 1912. *Printed.*

No. 48 Report of the Ontario Railway and Municipal Board, for the year 1911. Presented to the Legislature, 11th April, 1912. *Printed.*

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No. 49 Return from the Records of the General Elections in 1911. Presented to the Legislature, 7th February, 1912. *Printed.*

No. 50 Report of the Archivist of Ontario. Presented to the Legislature, 3rd April, 1912. *Printed.*

No. 51 Report on the State of the Legislative Library. Presented to the Legislature, 8th February, 1912. *Not Printed.*

No. 52 Report of the Game and Fisheries Commission, for 1909-11. Presented to the Legislature, 2nd April, 1912. *Printed.*

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No. 53 Statements of Provincial Auditor under Audit Acts. Presented to the Legislature, 26th March, 1912. *Printed.*

No. 54 Return to an Address to His Honour the Lieutenant-Governor of the Fourteenth day of February, 1912, praying that he will cause to be laid before this House a Return of copies of—

1. All correspondence which has passed since the 1st day of August, 1908, between the Government of the Province of Ontario or any member thereof or any person on its behalf, and the Government of the Dominion of Canada, or any member thereof or any person on its behalf, in reference to the Boundary between the Provinces of Ontario and Manitoba, through the territory now known as the District of Keewatin.

2. All correspondence which has passed since the 1st day of August, 1908, between the Government of the Province of Ontario or any member thereof or any person on its behalf, and the Government of the Province of Manitoba or any member thereof or any person on its behalf, in reference to the boundary between the Province of Ontario and Manitoba through the territory now known as the District of Keewatin.

3. All other papers in the possession of the Government in reference to the said boundary, including all reports in the possession of the Government in reference to the character and resources of the territory now known as the District of Keewatin. Presented to the Legislature, 20th February, 1912. *Mr. Rowell. Printed for Distribution.*

No. 55 Return to an Order of the House of the Fourteenth day of February, 1912, shewing—

1. What prosecutions have been instituted against parties in Northern Ontario for the illegal sale of liquor in Northern Ontario during the calendar year 1911.

2. The result of such prosecutions.

3. What amount the Government has received during the calendar year 1911 by way of fines imposed for the illegal sale of liquor in Northern Ontario. Presented to the Legislature, 20th February, 1912. *Mr. McDonald. Not Printed.*

No. 56 Copies of Orders-in-Council in accordance with the provisions of s-s. 6 of s. 78 of the Surrogate Courts Act. Presented to the Legislature, 22nd February, 1912. *Not Printed.*

No. 57 Copies of Orders-in-Council and Regulations required by section 27 of the Department of Education Act. Presented to the Legislature, 22nd February, 1912. *Not Printed.*

No. 58 Copy of Questions submitted to the Supreme Court, by the Government of Canada, relative to the *Ne Temere* decree and an Act to amend the Marriage Act. Presented to the Legislature, 27th February, 1912. *Not Printed.*

No. 59 Copy of an Order-in-Council of the Government of Canada, respecting the Boundary Line between Ontario and Manitoba. Presented to the Legislature, 27th February, 1912. *Not Printed.*

No. 60 Report upon Infant Mortality in the Province. (*Not Presented.*)

No. 61 Return to an Order of the House of the 23rd of February, 1912, for a Return of all correspondence from August, 1st, 1911, to date, between the Attorney-General or any official of his Department and any person or persons of the Town of Chesley or elsewhere, respecting the prosecution, conviction and fining of one Charles Subject by Magistrate Montgomery for an infringement of the provisions of the Liquor License Act. Presented to the Legislature, 1st March, 1912. *Mr. McDonald. Not Printed.*

No. 62 Merchant's report on the condition of English-French Schools in the Province. Presented to the Legislature, 6th March, 1912. *Printed for Distribution.*

No. 63 Copy of an Order-in-Council increasing the commutation paid to His Honour A. D. Hardy, Judge of the County Court of Brant. Presented to the Legislature, 13th March, 1912. *Not Printed.*

No. 64 Return to an Order of the House of the Twenty-sixth day of February, 1912, for a Return of copies of: 1. All correspondence between the Government or any member or official thereof or the Temiskaming and Northern Ontario Railway Commission or any member or official thereof and the Grand Trunk Pacific Railway Company or the Grand Trunk Railway or any official of either of them with respect to.

(*a*) The acquisition of running rights over the Temiskaming and Northern Ontario Railway;

(*b*) The leasing, running, or operating of dining, cafe, or buffet cars on the tracks of the Temiskaming and Northern Ontario Railway.

2. All agreements between the Government of Ontario or any department thereof or the Temiskaming and Northern Ontario Railway Commission and any other person or corporation with respect to:

(*a*) The acquisition of running rights over the Temiskaming and Northern Ontario Railway;

(*b*) The leasing, running, or operating of dining, cafe, or buffet cars on the tracks of the Temiskaming and Northern Ontario Railway. Presented to the Legislature, 19th March, 1912. *Mr. Rowell. Not Printed.*

No. 65 Interim Report on Laws, relating to the liability of employers to make compensation to their employees for injuries received in the course of their employment which are in force in other countries and as to how far such laws are found to work satisfactorily. Presented to the Legislature, 29th March, 1912. *Printed.*

No. 66 Agreement made by and between the Kinleith Paper Company, Limited, of the first part, and His Majesty the King, represented by the Honourable the Treasurer, of the second part, conditioned for the supply of printing paper for the use of the Province. Presented to the Legislature, 20th of March, 1912. *Printed.*

No. 67 Agreement made by and between the Montrose Paper Mills, Limited, of the first part and His Majesty the King, represented by the Honourable the Treasurer, of the second part, conditioned for the supply of printing paper for the use of the Province. Presented to the Legislature, 20th March, 1912. *Printed.*

No. 68 Agreement made by and between the Georgetown Coated Paper Mills, Limited, of the first part, and His Majesty the King, represented by the Honourable the Treasurer, of the second part, conditioned for the supply of printing paper for the use of the Province. Presented to the Legislature, 20th March, 1912. *Printed.*

No. 69 Bulletin of the Ontario Hospitals for the Insane in the interests of Psychiatry. Presented to the Legislature, 21st March, 1912. *Printed for Distribution.*

No. 70 Report on James Bay Survey Explorations, Cochrane to James Bay, June 9th to September 12th, 1911. Presented to the Legislature, 21st March, 1912. *Printed for Distribution.*

No. 71 Report of special investigation into the cause of Typhoid Fever in the Town of Sarnia. Presented to the Legislature, 21st March, 1912. *Printed.*

No. 72 A Return to an Order of the House of the 14th February, 1912, for a Return shewing: 1. All complaints received by the Government since the first day of January, 1911, in reference to the participation of any officers, officials or employees of the Government in political contests or taking part in political matters in this Province.

2. All correspondence arising out of or incidental to such complaints.

3. All correspondence passing between the Government or any Department or Member thereof and any officer, officials, or employees of the Government with reference to the participation of such officers, officials or employees in political contests or taking part in political matters in this Province since the first day of January, 1911. Presented to the Legislature, 22nd March, 1912. *Mr. Mageau. Not Printed.*

No. 73 Statement of the distribution of Revised and Sessional Statutes. Presented to the Legislature, 25th March, 1912. *Not Printed.*

No. 74 Return to an Address to His Honour the Lieutenant-Governor of the 14th February, 1912, praying that he will cause to be laid before this House a Return of copies of all correspondence between the Government of the Province of Ontario or any member thereof, or any person on its behalf, and the Government of the Dominion of Canada, or any member thereof, or any person on its behalf, with reference to the construction of permanent highways in the Province or grants to aid in such construction. Presented to the Legislature, 26th March, 1912. *Mr. Ferguson (Kent). Not Printed.*

No. 75 Return to an Order of the House of the 27th February, 1912, showing:—1. How many barrels of apples were produced in each year in each of the 45 Demonstration Orchards instituted by the Government. 2. What was the sale price *per* barrel of the apples from each of the said Demonstration Orchards. 3. What are the names and qualifications of the several orchard demonstrators now in the employ of the Government. Presented to the Legislature, 26th March, 1912. *Mr. Anderson (Bruce). Not Printed.*

No. 76 Return to an Order of the House of the 8th March, 1912, for a Return of copies of all correspondence between any person and the Government or any member thereof with respect to the construction of a Branch of the Temiskaming and Northern Ontario Railway to Elk Lake or further, with memorandum of dates upon which delegations waited upon the Government or any member thereof in support of the construction of the said Branch; also all surveyors' or other reports received by the Government with respect to the feasibility and cost of construction of the said Branch and all other papers or documents bearing upon the question of the construction of the said Branch. Presented to the Legislature, 27th March, 1912. *Mr. Mageau. Not Printed.*

No. 77 Return to an Order of the House of the 23rd February, 1912, for a Return shewing: The names of all persons to whom payments have been made in connection with the present Revision of the Statutes, and the total amount paid to each, and the services or other matter in respect of which such payments were made. Presented to the Legislature, 29th March, 1912. *Mr. Proudfoot. Not Printed.*

No. 78 Return to an Order of the House of the 15th March, 1912, for a Return of copies of all correspondence since the first day of January, 1911, between the Minister of Education, the Deputy-Minister of Education or any Official of the Department of Education and any School Trustee, Board of Trustees, or any person in the Township of Springer, with respect to the character of teaching in the Schools of the said Township, with respect to the teaching of French in the said Schools, with respect to the employment of teachers in the said Schools, or with respect to the giving or withholding of grants from the said Schools or any of them. Presented to the Legislature, 1st April, 1912. *Mr. Marshall. Not Printed.*

No. 79 Return to an Order of the House of the 28th day of February, 1911, for a Return shewing: (*a*) The number of sales of timber limits which have taken place in each year since 1905; (*b*) The location and acreage of each limit sold; and (*c*) The name of the purchaser in each case; (*d*) The price paid per acre, or otherwise, in each case; (*e*) The berth, or area of each berth, which had been under permit previous to the sale, with the original date of the permit; (*f*) The area of each berth damaged by fire previous to the sale; (*g*) The berth, or berths, which were virgin territory; (*h*) The reasons which caused each timber sale to be held from 1905 down to date; (*i*) The number of permits to cut timber current in the season of 1904-5; the number of permits to cut timber current in the season of 1910-11. Presented to the Legislature, 3rd April, 1912. *Mr. MacKay. Not Printed.*

No. 80 Report of Proceedings of the Twelfth Canadian Conference of Charities and Correction. Presented to the Legislature, 10th April, 1912. *Printed for Distribution.*

No. 81 Report of the Sixth Annual Meeting of the Canadian Hospital Association. Presented to the Legislature, 10th April, 1912. *Printed for Distribution.*

No. 82 Return to an Order of the House of the 14th February, 1912, for a Return of copies of all correspondence passing in the years 1905 and 1906 between the Attorney-General or any officer or official of his Department and Mr. J. W. Curry, K.C., Crown Attorney of the City of Toronto, or his successor, with reference to the prosecution of any alleged combines and all briefs, statements or other documents furnished by Mr. Curry to the Attorney-General or any officer or official of his Department with reference to any of the said alleged combines. Presented to the Legislature, 10th April, 1912. *Mr. Elliott. Not Printed.*

No. 83 Return to an Order of the House of the 9th April, 1912, for a Return of copies of (1) All correspondence between the Government or any Minister or Officer thereof and any person, association, board or organization whatsoever, between the 1st day of July, 1911, and the present date; and also (2) All protests, resolutions, objections or written statements of any kind whatsoever received by the Government or any Minister or Officer thereof, between the said dates with respect to: (*a*) The conduct of one S. J. Dempsey, in his official capacity as Police Magistrate or as Crown Lands Agent; (*b*) The participation of the said S. J. Dempsey in the Federal Election contest in South Renfrew; (*c*) The participation of the said S. J. Dempsey in the Provincial Election contests held in December, 1911. Presented to the Legislature, 12th April, 1912. *Mr. McQueen. Not Printed.*

REPORT

OF THE

Minister of Agriculture

PROVINCE OF ONTARIO

FOR THE YEAR ENDING
OCTOBER 31, 1911

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed and Published by L. K. CAMERON, Printer to the King's Most Excellent Majesty
1912.

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Printed by WILLIAM BRIGGS,
29-37 Richmond Street West, Toronto.

REPORT

OF THE

Minister of Agriculture.

To His Honour Sir John Morison Gibson, K.C.M.G., *a Colonel in our Militia of Canada, etc., etc., etc., Lieutenant-Governor of the Province of Ontario.*

May it Please Your Honour:

I have the honour to submit the Second Annual Report of this Department for the fiscal year ending October 31, 1911.

In my last Report, the first in the present form, I took occasion to supplement the review of the year's work with a few facts explanatory of the history and work of the Department and each branch thereof. It will not be necessary to duplicate this matter, as it is now available in printed form to any interested I will, therefore, as briefly as possible, review the leading features of the work of the Department in all its branches during the past year.

In doing so, I am glad to say much progress has been made both in the work of the Department and in agriculture generally. The past season, with its excesses of heat and drought, has been a very trying one for the average Ontario farmer, and yet in the aggregate they have come through in a manner which proves the diversity and stability of the farming industry in the Province.

Aside from the question of crops, there have been a number of developments which mean much for the future. From enquiries received at this office and from other signs, it is evident that there is a revival of interest in the land. A number of people from the cities have taken up land for farming purposes, and both local and outside syndicates have been quietly purchasing considerable acres in many districts, especially for fruit growing and truck gardening purposes. It is being recognized that Ontario's lands offer as good an opportunity for investment as those of any Province, and better than some. The result is a steady increase in farm values throughout the Province.

In this development I believe this Department has a part, and a perusal of the following pages will be found of interest.

ONTARIO AGRICULTURAL COLLEGE.

It is gratifying to be able to report another record year in the history of this institution. Altogether during the year in all the various courses and studies instruction was given to 1,557 persons. The advance which this means may be seen by a glance at the following comparison:

Attendance in 1911	1,557
Attendance in 1910 (record to that date)	1,386
Increase for the year	171

That the interest has been well maintained in every branch of the College work is shown by the following table, which gives the attendance in every department:—

AT AGRICULTURAL COLLEGE.

General Course	458	
Specialists in General Course Work	23	
Manual Training (One Year Normal Course)	15	
Teachers' Course (Agriculture and Horticulture, 76), (Industrial Arts, 23)	99	
Dairy Courses	37	
Stock and Seed Judging	182	
Poultry Raising	32	
Fruit Growing	162	
		1,008

AT MACDONALD INSTITUTE.

Domestic Science	353	
Nature Study (83), Elementary Agriculture and Horticulture (19), Woodwork and Mechanical Drawing (28), Art and Constructive Work (40), Domestic Science (26), (Summer School)	196	
		549
Total		1,557

There were also 120 children from the Guelph Public Schools who received instruction in Domestic Science at Macdonald Institute.

A few of the June excursionists arriving at the College.

A further examination of the roll in connection with the general course shows that the College continues to enjoy its world-wide reputation as well as its popularity with Ontario farmers. There were 68 students from countries other than Canada, England leading with 21. Other Provinces than Ontario contributed 58, of which British Columbia sent 31. The balance of 332 came from Ontario farms. Practically all participat-

ing in the Short Courses came directly from Ontario farms and went back at once to apply the principles they had learned.

I think the great increase in the attendance at the College and interest in its work can be attributed to the efficiency of the institution, and also in a considerable measure to the increased interest in up-to-date agriculture being developed by the general work of the Department.

I beg herein to give a brief *resume* of the experiments and other work carried on by the different departments of the College aside from the teaching. Those particularly interested will find the results worked out in detail in the regular report of the College.

GRAIN GROWING EXPERIMENTS.

As usual, under the direction of the Field Husbandry Department, a vast number of experiments in the growing of crops of all kinds have been carried out. These include not only the experiments on the 2,000 plots on the College farm, but also experiments on the farms of members of the Experimental Union. It is not possible here to do more than refer to some of the points brought out, but full details are given in the College and Experimental Union Reports.

In view of the extreme drought of the past season, it is interesting to note the record of rainfall as taken at the College for the growing months in the past eleven years, as follows:—

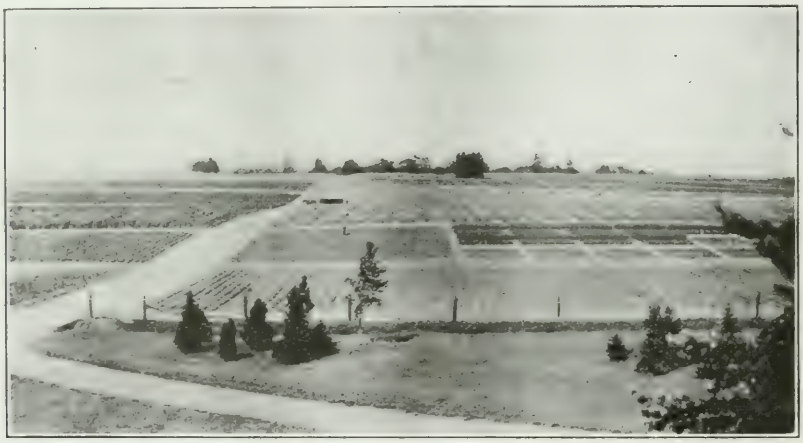
Month.	Inches of Precipitation during the Six Growing Months.											
	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	Aver. 11 yrs.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
April	2.24	2.43	2.69	2.10	1.82	1.44	1.66	1.33	3.60	3.13	1.67	2.19
May	3.26	1.67	2.44	3.01	3.89	2.71	2.64	3.47	3.43	2.75	1.64	2.81
June	1.53	3.06	3.05	2.86	3.24	4.06	1.11	3.21	1.33	.78	.89	2.28
July	4.07	6.43	2.67	4.99	4.60	4.65	1.92	3.25	4.54	1.89	1.95	3.73
August	3.51	2.18	3.47	3.88	1.98	2.13	.62	2.75	.89	3.18	2.53	2.46
September .	2.45	3.58	1.48	2.80	2.85	2.49	2.87	.73	.86	3.29	3.42	2.44
Total	17.06	19.35	15.80	19.64	18.38	17.48	10.82	14.74	14.65	15.02	12.10	15.91

It will thus be seen that the average was three and a half inches lower than last season's rainfall, and this reflects the experience of farmers in most parts of the Province. This drought was accompanied by excessive heat in July, and hence crops of all kinds were hampered.

For the College experiments about fifty acres of land were used. The tests were made with varieties of grain, root, tuber, grass, clover, fodder, silage and other crops; with artificial, green and barnyard manures; with methods of cultivation, selection of seed, dates of seeding, etc. All of these experiments are conducted with the greatest care, and for several years in succession in order to secure strictly accurate results. These experiments deal with the crops grown on over nine-tenths of the cultivated land in Ontario. The grounds have a gentle

slope towards the south-west, and the soil is an average clay loam. About one-quarter of the land is manured each year with twenty tons of farmyard manure per acre; thus most of the land receives an application of farmyard manure once every four years. No commercial fertilizers are used except in distinct fertilizer experiments, and each occupy only a small number of plots each year. Within the past twelve years, one green crop has been plowed under on each section of the field. The plots vary in size according to the requirements of the different experiments, and the yields per acre are determined from the actual yield of the plots in every instance.

During the past three years eleven new varieties of barley have been imported, including five tested during the past year, from Svalof, Sweden. Although the yields were all fairly good, none of them quite reached the Mandscheuri variety. The greatest yield per acre of all barleys grown in 1911 was obtained from a cross between the Mandscheuri six-rowed and the Chevalier two-rowed, originated at the College and tested during the past year for the first time.



A partial view of the Experimental grounds.

Of fourteen varieties of winter wheat tested, Dawson's Golden Chaff gave the highest yield per acre.

Results both here and in the United States show that the Variegated Canadian Alfalfa is very hardy and is worthy of special attention in the Province of Ontario.

Tests covering seventeen to twenty-three years show it to be quite possible to grow the same varieties for a considerable length of time without change of seed, providing care is taken in the selection of the seed and the growing of the crop.

The maximum yields from large, plump seed have been greater than the maximum yield from small plump seed in 91.7 per cent. of all the tests which have been made.

Thirty-nine separate and distinct lines of co-operative experiments were conducted during the past year through the Experimental Union on 4,490 farms, comprising all kinds of crops. Altogether in the past 26 years 63,302 distinct tests have been made in this line of work.

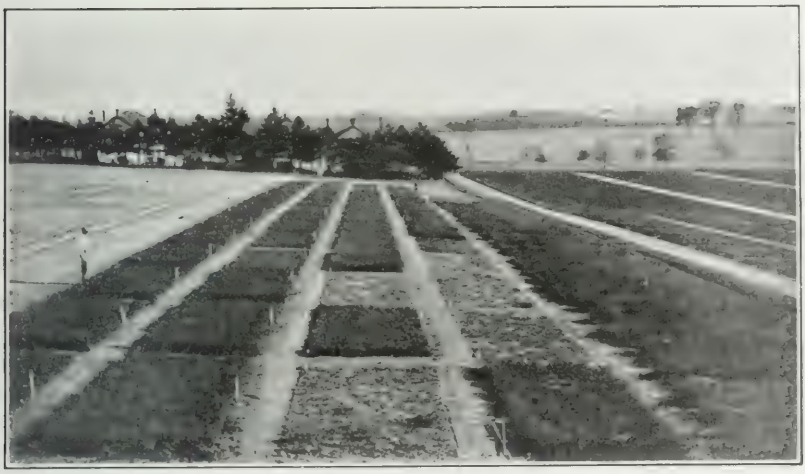
From two experiments strong evidence is obtained of the value of six-rowed barley and of oats in reproducing themselves, even when sown in combination

with a larger number of other leading varieties and classes of farm crops. Field peas, although a valuable grain when mixed with oats for the production of green fodder or hay, occupy a comparatively low place when grown in a mixture for grain production.

O. A. C. OATS NO. 72.

In connection with the experiments carried on through the Ontario Experimental Union, an organization of upwards of 5,000 farmers, directed by the Professor of Field Husbandry, one of the most promising results obtained was with oats. With a view to securing something a little better than the Siberian variety, now so popular, careful selection was made from over ten thousand heads from the best heads of oats year after year. In 1903 one was chosen and planted in the experimental plots, being known as O.A.C. No. 72. This year samples were given to eighty-seven experimenters for comparison with Siberian, Regenerated Abundance and Lincoln. The result in point was as follows:

O.A.C. No. 72	100
Siberian	88
Regenerated Abundance	75
Lincoln	74



A view of some of the Alfalfa plots. The difference of some of the strains in regard to hardiness is easily noticed.

In yield, the average of 87 different fields was:

	Pounds of grain per acre.
O.A.C. No. 72	1,354
Siberian	1,317
Regenerated Abundance	1,299
Lincoln	1,184

No. 72 yielded slightly less straw than Siberian, but of a stronger nature. These results are accepted as promising rather than conclusive, and they will be followed up in the coming years.

In the alfalfa tests, 100 experimenters in Lincoln, Welland and Haldimand found that healthy Canadian grown seed did not kill out like many varieties tried elsewhere. Similarly, the largest yield of mangels was secured from Ontario

grown seed. Interesting results were also secured with fertilizer. Barley, wheat, turnips, mangels and corn gave an extra yield well beyond the cost of the fertilizer. With wheat and oats the outlay was greater than the return. In each case, however, barnyard cow manure proved more satisfactory than the prepared commercial fertilizer.

EXPERIMENTS IN FEEDING.

In the Animal Husbandry Department some important experiments have been carried on in the feeding of dairy cattle, and some interesting results have been obtained.

Soya Bean Meal, a feed imported from England and a by-product of the Soya bean after the oil is extracted, dried brewers' grains, and cottonseed meal have each been compared in feeding quality with bran. Some molac dairy feed was mixed with each ration. Eleven cows were used in the tests.

In the dried brewers' grain experiment it was found that nine out of eleven cows showed an increased production of 3½ per cent., and in the case of the other two the decrease was slight. It is taken, therefore, as an indication that dried brewers' grains have a higher feeding value than bran for purposes of milk production.

Cottonseed meal proved quite equal to twice its weight of bran when used as a supplement to other meal. Although four cows showed a slightly lower milk yield, the total of the eleven cows was slightly higher on cottonseed meal than bran.

Soya Bean Meal, with a percentage of 41, is even higher in protein than cottonseed meal, and was therefore used as an equivalent of twice its weight in bran. The result was almost the same as cottonseed meal, and hence the conclusion is that soya bean meal has a feeding value of double the same quantity of bran.

It is notable in regard to all these tests that the fat percentage of the milk slightly decreased though the quantity increased. Quantity, however, is regarded as the better indication of feeling values.

Another experiment was made to try alfalfa hay as a substitute for meal, nineteen cows being employed, being divided into groups representing Holstein, Ayrshire and Jersey breeds. The results are accepted as proving the possibilities of alfalfa hay as a means of saving meal. The normal flow of milk was obtained and in the few cases where decreases occurred, they were only what might be expected under normal circumstances. It is believed that alfalfa hay may safely be used as a substitute for meal in the case of cows producing thirty pounds a day or under, but a meal ration is still necessary to make a large producer maintain her flow.

Some investigations with swine have been begun, but no final results have been obtained as yet.

NEW RECORDS IN EGG PRODUCTION.

The Poultry Department is able to report the best year in the matter of egg production in the history of the College, due to careful breeding, good housing and proper feeding. The hens laid exceptionally well in the winter and spring, and hence the department was able to supply nearly double as many eggs for hatching as in any previous year. In addition, large quantities were sold for from 35 to 50 cents per dozen for domestic use.

It is a well-known fact that 200 eggs in a year from one hen is a splendid

record and one seldom attained. Yet of 53 Barred Rock pullets of the bred-to-lay type, 13 or nearly 25 per cent. surpassed this high mark. The top record was 282, the showing of the first half dozen being 282, 268, 256, 252, 243, an average of 259.5. As far as I am aware, this record has not been surpassed anywhere on the continent, or, for that matter, in the world. For the whole 53 pullets the average for the year was 174, a total of 9,204 eggs. To this grand total the contributions were as follows:

13	of	the	pullets	laid	over	200 eggs
12	"	"	"	"	180	"
11	"	"	"	"	160	"
10	"	"	"	"	130	"
2	"	"	"	"	120	"
1	"	"	"	"	110	"
4	"	"	"	below	100	"

An experiement was carried on with a view to a comparison between 23 bred-to-lay pullets and 23 exhibition pullets. The bred-to-lay pullets laid 1,032 eggs more than the exhibition variety and at the same time consumed appreciably less food. On the other hand, the exhibition type were larger, weighing six to eight pounds each in comparison to five to six for the bred-to-lay type. At the same time the bred-to-lay mature more quickly and reach a six-pound weight in a shorter time. Not one of the exhibition type produced over 200 eggs, and only five over 150. Four of the bred-to-lay produced over 200 eggs each and eleven over 150.

Tests as to cost of feeding were made with 341 pullets. During the winter and summer months the foods that are kept constantly before the birds are rolled oats in hoppers, grit, oyster shell, and buttermilk. In summer the grain food consists of about 1-3 corn to 2-3 wheat fed in the litter night and morning. In winter the whole grain consists of equal parts of corn and wheat, and when the days are short it is thrown in the litter after the birds go to roost at night, and well forked over so that they have to work hard for it all next morning. At noon green food is given, either in the form of clover hay, roots or waste cabbage, and at night the whole grain is fed in troughs, the birds being fed all they care to eat, and what is left is removed.

The final figures showed the average cost per dozen in the winter months to be 20.76 cents, in the summer 9 cents, an average of 12.18 for the eleven months. The average cost of feeding each hen in winter was 11.76 cents, in summer 10.03 cents, making an average of 10.90 for the eleven months.

DAIRY EXPERIMENTS.

Under the direction of the Professor of Dairy Husbandry a vast number of experiments of value both to farmers and cheese factories have been carried on. One of the experiments had to do with the effect of over-ripe milk in the making of cheddar cheese. This was the fourth year that experiments on this subject were carried on, and in all twelve experiment were made, seven with over-ripe milk and five with normal milk. The results showed that 2.4 more pounds of cheese were made from 1,000 lbs. of normal milk than from 1,000 lbs. of over-ripe milk. The quality of the cheese was also superior. The practical lesson, therefore, to the patrons of cheese factories is that care should be taken to prevent milk becoming over-ripe, and this can be done by attention to cleanliness and by cooling to about 65° F. on the farm.

For some time past those interested in the subject have been endeavoring to produce a paper milk bottle so that milk may be delivered in cities and towns in a receptacle that may be thrown away after being once used, and thereby reduce the possibility of carrying disease. Some experiments were carried on during the past year with a view to comparing the single service bottle with the ordinary glass bottle. It was found that there was little difference in temperature or acidity, but the paper packages imparted a slight flavor to the milk after it had been standing in them for over twenty-four hours. One or two of the single service packages gave very satisfactory results and compared well with the glass bottles. If they could be placed on the market at a sufficiently low cost, there is reason to believe that their usefulness would be conclusively shown.

At the beginning of the year the commercial creamery which was formerly operated at the College was turned over to a firm, and is now being run as a com-

Yellow Leviathan Mangels from seed produced at the College.

mercial enterprise. More time is thus allowed to the College instructors for the teaching of students and the conducting of experiments in relation to the different problems.

DRAINAGE WORK GOES ON.

Under the direction of the Department of Physics an energetic campaign for the encouragement of tile drainage was carried on again along the lines laid down a few years ago. Following up applications received, men were sent out to various parts of the province to make survey for the farmers and to hold public demonstrations that the information might be brought to the attention of as many as possible. Altogether 327 surveys were made and 15,211 acres surveyed, about 600 more acres than last year. This provided for 1,864 miles of drain, 64 more than last year. The number of demonstrations increased by 10 to 142, but owing to weather the average attendance was not quite as high as usual. The increase in the work accomplished through the central agency is particularly significant of the awakened interest in the subject in view of the fact that we have now twenty District Representatives all over the Province, each making dozens of surveys. Then, undoubtedly, a great deal of drainage has resulted indirectly from the educational work of the

Department, as shown by the greatly increased output on the part of tile manufacturers.

CONTROL OF FRUIT PESTS.

The Department of Entomology has done considerable outside work investigating insects and pests, particularly those which assail fruit and fruit trees.

In the first place, two apple orchards were handled not very far from the College with a view to testing the value of lime-sulphur and arsenate of lead in the control of the codling moth and apple scab. The lime-sulphur was prepared in two large boilers at one of the orchards, and, though it cost only half as much as the commercial wash, it was found to be quite satisfactory. With one spraying just before the blossoms burst and another right after they fell, the results were shown in the fact that about 95 per cent. of the fruit was free from both worms and scab. Moreover, the foliage was almost free from injury and the fruit glossy. As this was the third season during which lime-sulphur and arsenate of lead had been tested, the results are considered conclusive in showing the mixture to be very effective against these pests.

Much attention has also been devoted to assisting the peach growers in combatting the disease known as Little Peach, which has been doing great damage in the Niagara District. Following up the preparation of a bulletin largely based on personal investigations in New York State, several weeks were spent with the local inspectors assisting them in identifying the disease which is new to this Province. Good progress has been made in the fight, although it is feared that upwards of 50,000 trees may have been destroyed, and the strictest precautions will have to be taken to prevent its spread through nursery stock.

Several experiments have been begun or advanced, one of special interest being an effort to combat the Apple Maggot, which has been causing a great deal of trouble to orchardists in Eastern Ontario.

FIGHTING WEED PESTS.

The Department of Botany has rendered considerable assistance to farmers in combatting weed pests of various kinds. Enquiries received indicate that the following weeds have caused most trouble during the past year: Field Bindweed, Russian Thistle, Bladder Campion, Crab or Finger Grass, Salad Rocket, Silverweed, Perennial Sow Thistle, Water Hemlock, Dodder, Penny Cress, Ground Cherry, Horsetail, Purple Goat's Beard, Paint Brush. In each case advice was given as to the best remedy to apply and these remedies will be printed in the College Report.

Although no serious outbreaks of fungus diseases were reported, a great many enquiries were received with reference to plant diseases. Of these, loose smut of wheat appeared to be the most widely spread and most serious. As in regard to weeds, remedies were pointed out and will be printed.

Progress has been made with experiments on the destruction of weeds by chemicals. One indicates that White Cockle can be prevented from producing seed by a thorough spraying with a 30 per cent. solution of iron sulphate just as the plants are coming into bloom. Another showed that a 20 per cent. solution of the same is effective in destroying Ragweed in cereal crops. Still another indicated that Poison Ivy can be destroyed by spraying with a 12½ per cent. solution of crude carbolic acid three or four times in a season at intervals of about three weeks.

Clover seed investigations have shown a great prevalence of weeds as well as inferior grades. It has also been found that many new weeds are being imported in alfalfa seed. These results will be published in detail in bulletin form.

STUDYING WELL WATER PROBLEMS.

The varied nature of the work carried on by the Chemistry Department is shown by the following list of analyses made and reported on during the year:

Soils	30
Fertilizers	15
Cattle Feeds	17
Dairy Products	44
Water	34
Insecticides and Fungicides	13
Miscellaneous	49
	202

It is evident that an increased interest is being taken in the matter of the water supply, because the enquries on this subjct are increasing each year. Of only a small proportion of the number examined could it be said with certainty that they were safe to use. A special study of this subject has, however, been made by this Department based on 140 samples collected by the District Representatives. From the analyses of these a bulletin dealing with the whole question of rural water supply will be issued.

In addition, 342 samples of flour have been tested for millers and bakers and 76 samples of wheat have been milled. Every year a number of early samples of wheat from the West are ground in order to show what millers may expect. Similar tests are made of Ontario wheat. These tests show that as far at least as No. 1 is concerned, this season's crop of fall wheat is practically the same as last year's in quality. Hence, unless later wheat from the West shows damage from frost, millers and others may expect flour up to last year's high standard. It is also interesting to note that the tests made from the wheat from the Ontario Agricultural College experimental plots for the past three years shows the wheat of 1911 to be quite superior in quality.

FORESTRY WORK.

Under the direction of the Professor of Forestry, who also has charge of the work of instruction, good progress has been made with the Norfolk Forest Station, comprising 1300 acres. There are at present in the nurseries about 928,000 plants in nursery lines and 1,100,000 evergreen seedlings in the seed-beds. During the season 200,000 plants of White Pine and Chestnut were put out on the waste portions of the property.

In addition, the plan for co-operative planting has been carried on as usual. In response to applications from farmers in different sections of the Province, 350,000 plants were sent out. Fifty collections of forest tree seedlings were also sent out under the direction of the schools section of the Experimental Union to be used mostly in school gardens.

By correspondence and public addresses assistance has been rendered to those interested in this important problem. In this connection I would like to call attention to an Act passed at the last session of the Legislature enabling County Councils to issue debentures to purchase waste lands for purposes of reforestation. It is gratifying to know that some counties are already moving in this direction. In view of the results obtained in European and other countries by municipal operation of forests, I think it would be well for every County Council to investi-

gate the conditions within its jurisdiction and whether or not there are areas of waste lands which could be advantageously set apart for forest purposes. I am satisfied that in a great many instances it will be found that a comparatively small outlay will ensure a splendid revenue in the years to come. This Department will be glad to render any assistance possible in the way of helping counties to get started on right lines.

AWAKENING INTEREST IN BEE INDUSTRY.

Greatly increased work on behalf of the beekeeping industry has been done under the direction of the Lecturer in Apiculture. In addition to the College work and the meetings of the Apiculture club, the revival of interest being taken in this industry was reflected in the Short Course held in May. Although it was the first course of the kind undertaken by the College, there were 43 in attendance from all parts of the Province. A great deal of work has also been done outside of the College. Bee Institutes have been addressed in several places and 27 apiary demonstrations were given in seventeen different counties. Demonstrations in handling live bees were also given at the Annual Exhibitions at Toronto, London, Alexandria, Renfrew, Peterborough, Oakville, Picton, Simcoe and Warren. There are now 17 County Beekeepers Associations in the Province.

Considerable work in connection with the enforcement of the Foul Brood Act was also done from the College, several students being employed as inspectors. Altogether 1013 apiaries were visited, and of these 414 were found to be diseased. It should be understood, however, that inspectors visited largely those suspected of being diseased, and hence it would not be fair to accept the figures as indicating the ratio to which disease prevails in the Province. It was found that European Foul Brood had spread rapidly in Carleton, Russell, Renfrew, Northumberland, Hastings, Prince Edward and Welland. Special plans to combat the outbreak are now under consideration.

TAKING AGRICULTURE TO PUBLIC SCHOOLS.

A distinct advance has been made during the past year in connection with bringing agriculture to the attention of public school teachers and public school children. The Professor of Botany and Nature Study on the staff of the College has been appointed Director of Elementary Agricultural Education under the Department of Education. There will thus be an officer whose whole time will be devoted to devising and carrying out plans with a view to interesting both teachers and pupils in the study of agriculture. He will continue to direct the work from the College and thus act as the connecting link between this Department and the Department of Education.

The work, as pointed out last year, is being built on the firm foundation of training the teachers for work of this nature. During the past summer, 78 teachers upon graduating from the Normal schools took the nine weeks' course in elementary agriculture and horticulture, thus qualifying for the bonus of $30 a year which the Department of Education offers to teachers possessing a certificate of this nature and carrying out a course of instruction in connection with a school garden.

In addition to this, the July course for teachers was attended by nearly 200 as compared to 120 last year.

The progress of the school garden idea is shown by the fact that last year 33 schools made application for the grant as compared to 15 the year previous. Reports received through the Schools' Division of the Experimental Union which has been

supplying seeds for flowers, vegetables, trees, farm crops, etc., indicate that about 150 schools are now engaged in this line of work with a view to interesting the young minds in the cultivation of the soil.

This work was started and has been carried on through the College and the Experimental Union, and I believe represents a substantial start in the right direction. Although it now passes to the direction of the Department of Education, to which it more properly belongs, it will continue to have our interest and sympathy and any assistance that may be rendered through the College, District Representatives or other agencies of this Department.

ONTARIO VETERINARY COLLEGE.

This institution has had another successful year. The attendance numbered 377, a slight increase over the previous year.

The written examinations held previous to the closing of the spring term in April numbered 33, which were arranged according to the subjects taught, so that each and every group of students in the three different years of the College Course received a full set of examinations.

At the closing exercises in April, 1911, 101 graduates were awarded the diploma of the College entitling them to the degree of Veterinary Surgeon (V.S.) In the month of June of the same year two of the graduates of 1910 were awarded the degree of Doctor of Veterinary Science (D.V.Sc.) at the Convocation of the University of Toronto, and at the same time and place 51 of the graduates of this College received the degree of Bachelor of Veterinary Science (B.V.Sc.) also from the University of Toronto.

The efficiency of the institution has been enhanced by the efforts to make the instruction more thorough and the equipment more up-to-date. In an effort to keep abreast with the times, the laboratory method of teaching has been extended from year to year, and since my last report a course in laboratory pharmacy has been given, and the courses in histology and pathology have been largely extended. The equipment for teaching the foregoing branches has been added to in proportion with the growth of the subject, and modern improvements have been recognized in the purchase of new material. In addition, the students are given an opportunity to visit a number of the leading farms in the district and receive the benefits of demonstrations with first-class live stock.

A great advantage in the laboratory method of teaching is that the student can make his own investigations, and follow up problems with the aid of a microscope or other equipment used in work of this kind, and thus obtain a practical knowledge of each subject which would otherwise be largely theoretical.

During the month of August, both the Veterinary College and the veterinary profession in general received material benefit from a meeting in this city of the largest and most influential gathering of veterinarians on this continent, if not the entire world. The Society which called them together is known as the American Veterinary Medical Association, and is composed of some 1,200 members who are more or less scattered over North America. There were about 700 of the more enthusiastic members at this meeting, besides a large number of visitors, and leading questions of the day relating to veterinary education, the eradication of contagious disease and other important questions of a veterinary character were freely discussed by talented men. The meeting extended over a period of four days, and the President of the Association in writing of it to a scientific journal says, "I presume that this was the largest, most enjoyable and successful meeting in our history."

The fact that the lease of the present building expires in a little over a year now compelled us to look about for new quarters. A site was secured and we will go ahead with the work of erecting a modern, well equipped building.

Ontario Veterinary College students study best types of animals on nearby farms.

BUREAU OF INDUSTRIES.

This Branch, as was pointed out last year, looks after the distribution of reports and Bulletins as well as the compilation of crop and municipal statistics.

The increased demand for publications on all subjects is another evidence of the increased interest in better agriculture. The following table shows the number of new bulletins issued and also the number of revised bulletins issued:—

184—"Uses of Vegetables, Fruits and Honey"	25,000
185—"Little Peach Disease"	4,000
186—"Children: Care and Training"	27,000
187—"The Codling Moth"	32,000
188—"Weeds of Ontario"	20,000
189—"Farm Poultry"	40,000
190—"Bee Diseases"	10,000
191—"Bee Keeping in Ontario"	10,000
192—"Agricultural Co-operation"	5,000
*158—"Disease Affecting Fruit Trees"	15,000
*171—"Diseases Affecting Vegetables"	10,000
*174—"Farm Underdrainage"	6,000
*175—"Farm Drainage Operations"	6,000
	210,000

The following crop and statistical bulletins have been distributed:

Crop Bulletin 106, November, 1910	17,000
Crop Bulletin 107, May, 1911	6,000
Crop Bulletin 108, August, 1911	6,000
Municipal Bulletin No. 5	6,000

These figures, of course, do not show the number of bulletins issued in previous years, for which there is still a big demand. The advantage of the bulletin is that it deals in a concise, authoritative way with practical subjects. A good distribution is also made of the larger reports, which contain many valuable articles. Following are the figures for the past year:—

Minister's Report	25,000
The Ontario Agricultural College	30,000
The Experimental Union	27,000
The Ontario Veterinary College	2,500
Agricultural Societies and Field Crop Competitions	20,000
Horticultural Societies	10,000
Vegetable Growers' Association	6,000
Live Stock Associations	30,000
Farmers' Institutes, I. and II.	34,000
Women's Institutes, I. and II.	25,300
Dairymen's Associations	30,000
Entomological Society	3,000
Fruit Growers' Association	4,000
Fruit Branch	6,500
Ontario Corn Growers' Association	5,000
Beekeepers' Association	3,000
Bureau of Industries (Agricultural Statistics)	7,000
Bureau of Industries (Municipal Statistics)	6,500
	274,800

*Second Editions.

AGRICULTURAL SOCIETIES BRANCH.

There are now 355 legally constituted agricultural societies in the Province, and the "fall fair" shows no abatement in popularity. All these societies held exhibitions with the exception of nine, which devote their attention to the purchase and maintentance of pure bred male animals of the breeds best suited for their respective localities. This line of work is also carried on by a number of others which hold exhibitions in addition.

The past season was notable for the number of wet days which happened to be exhibition days. Over one hundred fairs suffered very severely from the rain. Consequently the provision for "rainy weather" insurance made at the last session, proved very acceptable and timely. By this arrangement, made with the approval of the societies, it was provided that $10,000 of the total grant of $15,000 should be set aside to assist unfortunate societies. It was apportioned at the ratio of 50 per cent. of the gate receipts, fixed on the basis of the average of the proceeds of the three previous years. A little over one hundred societies claimed assistance from this fund.

Revival of interest in plowing matches.

The field crop competitions were again carried on most successfully, in pursuance of the plan of co-operation between the agricultural societies and this Department. Although it was announced that only the first hundred societies applying could be admitted, it was found that the appropriations would allow for 104. This was slightly under the number for the previous year, but it will be noticed the number of farmers taking part and the number of acres under crop materially increased. The record of growth in these competitions is shown by the following figures:—

1907	10	societies	325	competitors	300	acres
1908	46	"	656	"	660	"
1909	77	"	1,200	"	20,000	"
1910	110	"	1,650	"	26,000	"
1911	104	"	1,800	"	28,000	"

Grain from the prize winning field was allowed to compete as usual at the Guelph Winter Fair for Western Ontario, at the Ottawa Winter Fair for Eastern Ontario, and at the Canadian National Exhibition, Toronto. All the prize grain

was returned by the Department for distribution among our District Representatives, who will hand it out to the farmers in order to demonstrate the value of good seed. I am glad to say that this important work will be given a fresh impetus next year by reason of the co-operation of the Dominion Department of Agriculture, which has arranged to make a substantial grant for the work through this Department.

There has been a marked revival of interest in the good old-fashioned plowing match and a grant of $250 was made this year to the Ontario Plowman's Association, which has been encouraging the formation of local associations and the holding of local plowing matches with much success.

The spring seed and stock shows have been carried on as usual and in addition to the grants given, lecturers and judges have been sent out by the Department.

VEGETABLE GROWING, HORTICULTURE.

The Vegetable Growers' Association has had a very satisfactory year and has shown good progress, by reason of the fact that it has concentrated its energies on lines of work calculated to make for the betterment of its individual members.

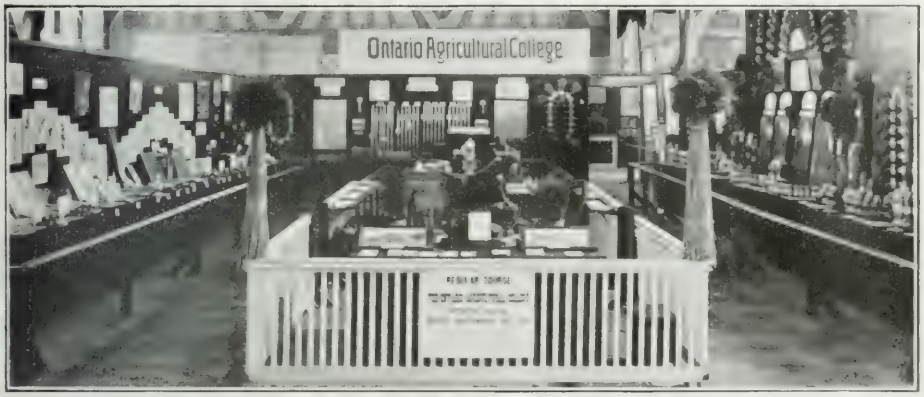


Exhibit of the Ontario Agricultural College at the Educational Building at the Canadian National Exhibition at Toronto, 1911.

For instance, they have been conducting experiments in the growing of potatoes in New Ontario from New Brunswick seed. They find New Ontario soil is admirably suited for this purpose. Next year they will extend these experiments to include the growing of seed peas from seed imported direct from Germany. They are confident they can thus secure a supply free from weevil and blight. Then, too, co-operation has been adopted by a number of branches in the purchase of baskets, boxes, fertilizers, Paris green and other requirements, and it has been found to work quite satisfactorily.

In connection with horticultural work there has been during the year an increase of four societies and of over 1,000 members. The total membership is now over 11,000. The work of the societies is to encourage both home and civic beautifying. Plants, bulbs and seeds are distributed to members together with instructions as to how to make the best use of them. In some places prizes are awarded for the best kept front and back yards in the poorer sections, and also for the best lawns and gardens. The improvement of parks and public squares, and the placing of flower beds in front of hospitals and public buildings, are a few things everywhere encouraged. Efforts are now being put forward with a view to securing the removal of eyesores, such as billboards.

LIVE STOCK BRANCH.

The various exhibitions held under the auspices of this Branch for the encouragement of the great live stock industry of the Province continue to increase in number, attendance and usefulness. The two leading Shows of this nature are, of course, the Ontario Provincial Winter Fair at Guelph and the Eastern Ontario Live Stock and Poultry Show at Ottawa. As these shows are held very early in the fiscal year beginning November 1, it is only possible to refer here to the Shows held in December, 1910, and January, 1911.

Some idea as to the extent of the growth of the Winter Fair may be obtained from the following summary:—

	Gate Receipts.	Entries.
1900	$1,147.70	3,069
1904	1,943.10	3,932
1908	2,002.60	5,521
1910	3,837.80	6,810

Young men's judging class at a fall fair.

The Winter Fair of December, 1910, very distinctly showed the necessity of increased accommodation, and after the Exhibition the question was taken up by the Winter Fair Board with the Department of Agriculture and the City of Guelph, with the result that a new building for the accommodation of horses was erected. Ten thousand dollars was appropriated by the Department of Agriculture for this purpose, and the City of Guelph provided a portion of the land on which the building was erected. The building provides accommodation for about one hundred head of horses.

The Eastern Ontario Live Stock and Poultry Show has also made very rapid strides in the past three years, both in attendance and exhibits. The most noticeable increase at the past Show was in the Dairy Department, for which a new building was erected giving double the capacity previously provided. It was found, however, that this was not sufficiently large, and for about 25 per cent.

of the exhibit other accommodation had to be found. The meetings, at which practical addresses are delivered, are well attended, and a great interest is manifested in the Exhibition by persons who reside in the eastern part of the Province who are interested in live stock.

There are also many indications that the smaller horse shows throughout the Province are doing good work. During the past year sixteen such shows were held by associations or organizations independent of agricultural societies. These are aided financially in accordance with the size of the show and the extent of the local prize list offered.

PROFITS IN SHEEP RAISING.

It is now possible to present the results obtained for the first year's demonstration in sheep raising as carried on at the sheep stations arranged in conjunction with the Ontario Sheep Breeders' Association. The experiment is to cover a period of three years. While the results of the first year, therefore, are not to be considered final, they indicate clearly the profits to be realized on the proper handling of a flock of sheep, and should contribute materially to the revival of the sheep raising industry, for which there is so much scope in this Province, especially in view of recent legislation for the protection of sheep from dogs. The following tables will repay a close scrutiny on the part of those interested in the industry:—

In Charge of Station.	Address.	Breed of Ram.	Number of Ewes.	Value per head.	Value of flock including ram at $25.00.	Interest on investment at 6 per cent.
				$ c.	$ c.	$ c.
Isaac M. Kenyon ..	Perth.....	Southdown ...	10	6 50	90 00	5 40
Edwin Johns.....	Fairfield East....	Cotswold	10	6 50	90 00	5 40
D. C. Ross.....	Woodville.....	Leicester	12	8 00	121 00	7 26
John McKee	Duntroon	Shropshire...	10	8 00	105 00	6 30
W. A. Creighton...	Paris.....	Hampshire...	10	8 00	105 00	6 30
John Pritchard....	Redgrave	Oxford	9	6 50	83 50	5 01
A. M. Dickie	Hyde Park.....	Lincoln	12	8 00	121 00	7 26
Wm. Aitkins.....	Windermere	Dorset Horn..	12	6 50	103 00	6 18
Wm. Little	Brown's Corners..	Southdown...	12	8 00	121 00	7 26

The lambs raised at all stations except Brown's Corners and Windermere were sold when about one year old. The lambs from the station at Brown's Corners were intended to be marketed as early spring lambs, while those from Windermere were to be sold during the summer to hotels in the neighbourhood doing a tourist trade. At Brown's Corners some of the lambs were not dropped early enough to be sold at the highest price, and some were carried over until the following spring, the station being credited with the price of the lambs when sold and charged with the expense of feeding during the winter. Where any losses have occurred in any of the flocks, the full cost has been charged against the flock. The Station at Fairfield East was specially unfortunate in this respect, having lost two ewes as well as the ram.

	Receipts.					Expenses.					Profit.
	Wool.					Feed. Ewes and Ram.	Feed. Lambs.	Loss-es.	Inter-est on in-vest-ment.	Total.	
	lbs.	Price.	Value.	Lambs.	Total.						
	lbs.	c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
Perth	69	*.24	16 56	93 75	110 31	23 75	30 40	.....	5 40	59 55	50 76
Fairfield East	85	.13½	11 47	131 49	142 96	43 42	36 62	38 00‡	5 40	123 39	19 57
Woodville	130	.13½	17 55	162 86	180 41	43 70	39 11	8 00	7 26	98 07	82 34
Duntroon	109	.13	14 17	95 55	109 72	36 87	29 10	8 00	6 30	80 27	29 45
Paris	77	.14	10 78	158 50	169 28	52 34	60 00	.....	6 30	118 64	50 64
Redgrave	65	*.21	13 65	83 36	101†81	43 03	37 80	6 50	5 01	92 34	9 47
Hyde Park	132	.13	17 16	128 70	145 86	53 98	58 58	.....	7 26	119 82	26 04
Windermere	100½	.13	13 06	78 00	91 06	38 88	.....	.....	6 18	45 06	46 00
Brown's Corners	80	.15	12 00	109 07	121 07	39 65	12 09	.....	7 26	59 00	62 07

* Washed.
† Includes $4.80 for service of ram.
‡ At Fairfield East losses included ram and two ewes; in each of the other cases one ewe was lots.

ENCOURAGING POULTRY RAISING.

Local Poultry Associations are encouraged throughout the Province by provision being made to give a grant to one local Poultry Association in each electoral district and incorporated city. There are at the present time forty-four local poultry associations receiving grants. In addition, a lecturer, whose expenses are born by the Department, is in attendance at each of these Shows to give an address on practical subjects in connection with poultry raising. Several new Associations are organized each year.

WESTERN SHIPMENTS OF PURE BRED STOCK.

During the past year there were shipped to Western Canada on the co-operative plan nine car loads of pure bred stock. These cars were made up of live stock sold by individual breeders in Ontario to a number of different buyers in the West. On account of the long haul from Ontario to the West, the freight on individual animals is very high, and, as it is necessary to have a man in charge, is practically prohibitive. By assembling these individual animals together, when sufficient sales have been made to make up a car load, each person is enabled to obtain the benefit of a car load rate. Each car usually goes as far as Calgary, and stock is unloaded at different points between Winnipeg and the destination of the car. These cars were shipped at different times between January and October, and in them were included 58 horses, 51 cattle, 51 sheep and 18 head of swine.

FARMERS' INSTITUTES BRANCH.

The Farmers' Institute during the past year showed a slight increase in membership and a slight decrease in attendance at meetings. The membership is now 20,215 and the attendance at meetings aggregated 105,516. The total attendance at meetings held under the direction of this Branch during the past winter was as follows:—

Regular and Supplementary Meetings:	
Farmers' Institutes	105,576
Women's Institutes	151,654
Special Institutes:	
Better Farming Special	8,500
Fruit Institutes	10,121
Seed and Live Stock Judging Classses	38,850
Factory and Creamery Meetings	13,606
Total	328,307

The new feature of the work was the running of what was known as a "Better Farming Special" over the Michigan Central Railway in Southern Ontario. For some years past the Department has been endeavoring to secure the co-operation of Canadian railways in work of this kind, but the Michigan Central was the first line to equip and place a train at our disposal. It consisted of three exhibition cars and three regular coaches, the cars being equipped with:—

(1) All up-to-date equipments used by the fruit growers, with samples of spray mixtures and an exhibit of insects, and diseases prevalent in orchards.

(2) Modern dairy appliances with samples of butter and cheese. Bacterial samples showing proper care of milk. Samples of corn and methods of storing and testing seed corn were shown.

(3) Sample of grains, grasses and noxious weeds; poultry foods and small up-to-date houses. Drainage tools with an exhibit illustrating the results of proper systems.

They were manned with competent lecturers from the Ontario Agricultural College and elsewhere, and stops were made at thirty-two stations in eleven days. The novelty as well as the practical nature of the lectures aroused great interest and altogether over 8,000 people attended the meetings and demonstrations. An effort was made to take up the subjects of particular local interest at each place at which a stop was made.

Now that a start has been made in this line, I anticipate co-operation on the part of other railroads and consequent extensions of the work.

WOMEN'S INSTITUTES.

Marked increases have been made during the past year in the Women's Institutes. From 600 the number of Institutes has increased to 670 and the membership from 14,000 to 20,000. The organizations being of a local character, they apply themselves not only to the problems of the home, but to the problems

of the community as well. School gardens and home gardens, school sanitation, improvement of parks, improvement of water supply, were among the matters to which attention was devoted.

Through the Institutes Branch an experiment in domestic science teaching was carried on by six branches—Delhi, Hagersville, Caledonia, Dunnville, Canfield and Cayuga—a domestic science teacher was employed from October to February, inclusive, to give a series of demonstration lectures covering a period of fifteen weeks. The instructor spent one day each week at each place. Each Branch was required to secure at least twenty-five persons to attend the classes regularly. At some points as many as sixty took advantage of this new form of instruction.

Crowds visiting first "Better Farming Special" ever operated in Ontario.

This course indicates that the women in the rural districts are anxious for scientific instruction and are prepared to bear a considerable proportion of the expense connected therewith.

CLUBS AND SHORT COURSES.

The most popular form of farmers' organization to-day is the Farmers' Club. It is popular because it is local, definite and concrete. Its members are not spread over a large area, it takes up matters of practical local interest and it grapples with its questions at close range. The number of Farmers' Clubs increased during the year from 164 to about 215, chiefly in counties where District Representatives are located. Aside from social and educational gatherings, they have taken up such matters as co-operation in the purchase of supplies, the establishment of rural telephone lines, the introduction of pure bred stock, the securing of pure

seeds and similar practical activities. The results have invariably been of great advantage to individual members and benefit to the community.

Similarly, short courses in stock and seed judging are proving to be among the most popular and effective educational means. These were held at forty places throughout the Province, generally under the auspices of the local Institute and frequently with the co-operation of the local representative. The Institutes' Branch has supplied a large tent for the use of places which do not possess suitable accommodation. The local farmers have supplied the live stock and competent speakers from the Department have been on hand to point out in the most practical way the good and bad points in each type of animal. This is followed by a discussion so that the desirable points in an animal or in seed may be impressed

Studying the Horses outside the tent at Short Course in Live Stock.

thoroughly on the minds of those present. It has been very gratifying to notice the large number of young farmers who have been attending these gatherings and taking a deep interest in the instruction given.

DAIRY WORK.

The past year has been a notable one in the dairy industry in the Province. It has witnessed the highest prices ever paid for cheese. It has also witnessed some material improvements as a result of the work of the thirty-four inspectors under this Branch. Then, too, the recent legislation calling for the registration of cheese factories and the taking out of certificates by makers has led to greater care in the factory and higher efficiency on the part of the maker. Permanent certificates have been granted only to those who have shown marked efficiency, others receiving one-year certificates only.

The report of the Chief Instructor for Eastern Ontario showed a decrease in the output of cheese and an increase in the manufacture of butter. The number of cheese factories decreased from 933 to 913, eleven being closed by reason of amalgamations, seven being burned and two changed into creameries. The number of cheese factory patrons decreased by 221 to 33,107, and the number of cows supplying milk decreased by 12,369 to 307,398. The average production, however, increased by 153 pounds to 3,406 and there has apparently been a weeding out of some unprofitable cows. The cheese output decreased by 3,618,839 lbs. to 93,634,568 lbs. On the other hand, the output of creamery butter increased by 599,473 to 2,311,473. This with the increased demands for milk for human consumption doubtless explains the decrease in cheese production. As an indication of improved conditions, the report points out that during the year adulteration

Summer meeting of club for study of dairy cattle.

decreased by one-third in the year. In nine of the twenty-four districts no adulteration was found, and out of 29,098 samples of milk tested only 91 showed adulteration. In the factory end of the business it was noted that 10 new factories were constructed and 527 improved. In the farm end it was found that 830 new silos were erected and 1,253 dairy stables whitewashed during the year.

In Western Ontario a similar decrease in cheese and increase in butter is noted by the report of the Chief Instructor. The increase in the output of butter aggregated 1,758,000 lbs., bringing the total up to 11,310,000 lbs. This represented an increase of 4,328 in the number of creamery patrons and there was also noted an improvement in the quality of the cream. The exact figures as to the extent of the decrease in cheese production are not yet available, but the production in 1910 was a little over two million pounds less than in 1909, being ascribed to the increased demand for creamery purposes and for home consumption.

Exhibit of Ontario fruit at Winnipeg Exhibition.

FRUIT BRANCH.

In keeping with the awakened interest in the fruit growing industry all over the Province, the work of this Branch has developed rapidly during the past year.

One big feature of the work carried on which has proven both beneficial and popular has been the Demonstration Orchard work. Following up the start made with six orchards in 1910, thirty-five orchards were handled during the past season and the value of up-to-date orchard methods was brought to the attention of thousands of farmers in the most practical manner. That these orchards were well distributed over the Province is shown by the following locations:

Hastings County	6
Grey County	3
Essex and Kent	3
Wentworth County	4
Northumberland County	2
Durham County	2
Simcoe County	8
Dundas County	4
Glengarry County	3

Of these, all except Simcoe, Grey and Wentworth were directly under the supervision of the District Representative for the respective counties, this Branch supplying the men and money and advising in the management. In the other counties the work was directly under the control of this Branch. In the north the work was hindered by a shortage in the crop which materially affected the returns from some of the orchards. Again, the prevalence here of many fall and undesirable winter varieties lowered the receipts. With a good crop and suitable kinds, this district can hold its own with any in the Province, as is shown by the following statement from one of the Simcoe orchards:

ORCHARD OF W. L. HAMILTON, COLLINGWOOD.

Receipts.

1911.

114 baskets Harvest apples	$18 40
17 baskets Crab apples	3 88
20 baskets Pears	8 00
227 bbls. No. 1 apples at $3.50	794 50
17 bbls. No. 1 fall apples at $2.50	42 50
16 bbls. No. 2 winter apples at $3.50	56 00
1 bbl. No. 1 fancy apples at $4.00	4 00
190 boxes fancy	336 50
27 bbls. No. 111 at $1.50	40 50
Windfalls and culls	51 00

Expenditures.

Pruning; 2 men, 8 days at $2.00 per day	$32 00	
Spraying, 4 times; 3 men, 7 days at $2.50 per day	42 00	
Spraying; 1 man and team, 7 days at $3.00 per day	21 00	
Lime-sulphur, 2½ bbls. at $8.50	21 25	
Arsenate of lead, 150 lbs. at 12c.	18 00	
Man and team cultivating, 10 days at $3.00	30 00	
Picking and packing apples	139 32	
287 apple bbls. at 40c.	114 80	
Hauling apples to station, 6 days at $3.00	18 00	
Balance	918 91	
	$1,355 28	$1,355 28

Profit, $918.91 on a 3½ acre orchard, consisting of 195 apple trees, 1 crab apple and 2 pear trees.

This orchard was handled by the Department in 1910 and was looked after very largely by the owner during the past season. It, therefore, shows the advantage of following up the Government's example.

SOME 1911 RESULTS.

Leaving out of account the pruning of these neglected trees, which was a heavy item of expense not to be incurred again, we have the following record of the northern orchards in 1911.

Meeting in a demonstration orchard.

Name.	Address.	No. of Trees.	Expense.	Returns.
			$ c.	$ c.
John Alderson	Elmgrove	80	40 87	58 65
Mrs. Alex. Morrison	Cookstown	72	19 87	143 10
F. Campbell	Randall	74	37 15	123 15
David Jennet	Ivy	55	23 29	74 85
W. J. McLean	Ivy	60	24 94	60 95
W. Brown	Cundles	100	45 26	189 60
Jas. Lang	Owen Sound	70	44 17	128 20
W. Gauley	Milton Grove	50	23 87	109 20

Mr. Jennet reserved the Spies in his orchard, which somewhat reduced the returns.

From the sales of the fruit have been deducted the cost of packing and packages and the owner of the orchard has been allowed for his own time in the expenses.

Records from the eastern counties are also good and prove that varieties like the McIntosh and Snow, which succeed admirably there, can show just as handsome profits as the orchards of winter varieties further west in the Province. Two from the Glengarry County demonstration orchards are given herewith:

Name.	Address.	Acreage.	Expense.	Returns.
			$ c.	$ c.
L. A. Parisien	Summerstown	2½	54 78	139 60
A. A. McEwen	Dominionville.....	2	41 45	181 75

The first orchard has been planted 10 years and out of 200 trees only 65 were in bearing this season. The second orchard was much older, with a number of blanks where tender varieties had been killed out. It must be remembered, too, in all these cases that the orchards are not selected for their good qualities, but rather for their dilapidated condition as being more fit for demonstration purposes. Even the lowest yields show a splendid return on investment and labor.

ORCHARD AND NURSERY INSPECTION.

Realizing that with the advent of the Little Peach into the Niagara Peninsula, the growers there would lose heavily unless immediate inspection was carried out, the townships interested, with few exceptions, took more interest in this work. Aided by the Department, who provided a specially trained man for supervisor, the local inspectors were more active in their work, spending sufficient time to go over the orchards twice in those townships which were most seriously affected. While the results of the inspection were quite alarming, revealing the widespread nature of the disease, still with the backing of the growers all infected trees were removed, and a continuance of such inspection for a few years should soon clear up the district. Owing to the nature of this disease and Yellows, the orchardists must expect to be constantly on the watch themselves for diseased trees which may show up at any time. Over 50,000 trees were condemned during 1911, quite a large percentage out of the 800,000 in the Niagara district. All of the townships in the Peninsula appointed one or more inspectors, those in the western part spending the most money, however, in their efforts to keep down these and other pests.

The nurseries underwent their usual inspection of stock during fumigation and the greater part of the stock in the fields was also examined. Infested trees were destroyed, while all stock was required to be fumigated before shipment with hydrocyanic acid gas.

PEACH SHIPMENTS TO GREAT BRITAIN.

Following up the commercial shipments of 1910, the Department again assisted Mr. C. A. Dobson, of Jordan Harbor, in forwarding several thousand cases of this fruit to Covent Garden Market, London, England. Officers of the Fruit Branch supervised the picking, grading and packing and loading in the cars. Better success attended the transportation this year, as there were no losses from damage in the cold storage chamber on the boats, as was the case with one large consignment in 1910. Cases shipped in different stages of ripeness arrived in equally good condition and proved conclusively that our fruit will carry long distances just as well as that from dryer sections.

Prices for the fruit ranged from 3 to 5 shillings wholesale per case of from 15 to 20 peaches. The receipt of several thousand cases from Washington State at the same time as our Ontario fruit helped to keep the prices down near the level of cost. This will undoubtedly remedy itself as the British buyer becomes familiar with our peaches and prepares to buy at that season in large quantities. It is to be hoped that shipments will be continued and gradually enlarged as the demand increases.

Our London Office has been able to make good use of these shipments for advertising Ontario, the only Province in the Dominion that is now growing peaches on a large scale.

FRUIT EXPERIMENT STATIONS.

At the Horticultural Experiment Station at Vineland continued planting has taken place, including a commercial apple orchard of standard winter varieties, which will be used for testing methods of cultivation, cover crops, etc. The fillers in the orchard set in 1908 bore fair crops this season and from now on should make some showing. The peaches and sour cherries should also give some crop this season. The old orchard of 4 acres bore a very clean crop of Greenings, the other varieties being light. With the tearing down of the old barn this winter there will be available quite an additional acreage for peaches or cherries.

In my last report I mentioned the fact that the Department had been instrumental in having a station placed on the Grand Trunk at Vineland. In so doing we advanced $3,000, to be paid back when the receipts at the new station and the Jordan Harbor station, a few miles away, exceeded the amount received in the previous year at the Jordan Harbor station by at least $80. I am glad to say that after being in operation only about a year the business at the station was so great that the railway refunded the money advanced with interest.

Extensive damage from the storms of Lake Ontario has resulted to the farms along the shore, and owing to the loss of much high priced land, has caused considerable anxiety to many of the fruit growers. Several acres of land have already been lost to the Government from this cause, and experiments are now under way to prevent any further washing. One pier 60 feet in length was built two years ago, and while found satisfactory in some ways, was found to be too expensive for the ordinary farmer to build and maintain. The past season several hundred feet of concrete blocks running parallel with the bank were constructed, and if found efficient, the protection will be continued across the entire lake front of the property. The cost of the 250 feet already built was $174.48 for labor and $200.17 for material, making a total of $374.65. This could be materially reduced as the labor could all be furnished by the farmer and his hired help, the work being done in the fall, after the fruit harvest has been completed.

FRUIT GROWING CONDITIONS IN ONTARIO.

With the co-operation of the Guelph College staff this Branch was able to keep several men in the field investigating problems of interest to the fruit grower. Orchard surveys were continued and completed, covering several of the eastern counties, the Niagara district and the Lake Huron shore, most of these being published in detail in the Report of the Fruit Branch for the past season. Some of the figures are given below to show the extent of the fruit industry in six of the townships of the Niagara district on Lake Ontario. These figures cover the trees in the larger commercial orchards only.

Barton, Saltfleet and Grimsby Townships.	
Apples	43,296
Pears	75,617
Plums	217,227
Cherries	37,695
Peaches	379,540
Grapes	1,007,938

Louth, Grantham and Niagara Townships.	
Apples	51,399
Pears	71,146
Plums	86,820
Cherries	32,611
Peaches	595,703
Grapes	1,080,112

It will be seen that the apple occupies a comparatively small place in the fruit industry of this important district, the peach and grape predominating. North of Lake Ontario, however, the change is sudden to the hardier fruits. For instance, one township, Murray, in Northumberland County, shows 98,570 trees, more

Fine crop of apples on a tree which has been properly cared for.

in a single township than in the entire Niagara Peninsula. On the other hand, the tender fruits, except perhaps in a few gardens, are almost entirely absent. Northumberland County is pre-eminently an apple county, especially along the lake as the following figures show:

Townships.		Bearing.		Non-bearing.		Total Acreage.	Total Number of Trees.
		Trees.	Acres.	Trees.	Acres.		
Lake Townships ..	Hamilton	27,840	575	26,768	555	1,130	54,608
	Haldimand ..	31,796	618	29,939	611	1,229	61,735
	Cramahe	47,021	955	35,246	786	1,741	82,267
	Brighton	38,255	849	34,035	727	1,576	72,290
	Murray.....	49,480	977	49,090	1,034	2,011	98,570
Inland Townships .	Seymour	1,900	35	.....	.....	36	1,900
	Percy	7,805	168	5,100	109	277	12,905
	Alnwick.....	1,095	22	.....	.....	22	1,095
	Totals	205,192	4,199	180,178	3,822	8,021	385,370

VALUE OF SPRAYING.

These surveys showed conclusively the value of spraying. A comparison between fifteen orchards of each class in Northumberland County gave the following results as an average over three years.

15 orchards, cultivated, fertilized and sprayed, net yearly income per acre, $125.10.

15 orchards, cultivated, fertilized and not sprayed, net yearly income per acre, $81.35.

A further comparison of all orchards visited still further shows that modern orchard methods pay handsomely for the time and trouble.

Demonstration orchards show that spraying yields good returns.

Average per acre.	1907.		1908.		1909.		Average yield in bbls. for 3 years.	Average income per acre for 3 yrs.	Average price per bbl. for 3 years.
	Bbls.	$ c.	Bbls.	$ c.	Bbls.	$ c.		$ c.	$ c.
50 Cultivated, fertilized and sprayed (486 acres)	75.0	92.15	43.3	58 80	47.0	68 10	55.1	73 00	1 32
63 Cultivated, fertilized and not sprayed (344 acres)	52.7	55.60	32.0	37 15	38.1	42 75	40.9	45 16	1 10
69 Cropped (344 acres)	46.3	47.20	25.6	31 15	35.8	39 45	35.9	39 25	1 09
9 Sod (188 acres)	41.6	43.60	33.0	30 60	39.2	42 28	37.9	38 82	1 02

NOTE.—The incomes per acre and prices per barrel are in every case the value on the tree In the case of the sod and cropped orchards there was very little spraying done, so that it was not taken into account.

ADVERTISING ONTARIO FRUITS.

Toronto and Winnipeg, the two foremost exhibitions in the Dominion, were again chosen for the principal exhibits of our Ontario fruits outside of the November Horticultural Exhibition, where the apple reigns supreme. The West, as shown by the census, is rapidly growing in population and wealth and the markets there should be held at whatever expense for our fruit growers. From present indication Ontario will long continue to supply peaches for both East and West and with increased consumption and improved transportation facilities, the markets will take an enormous quantity of this fruit.

The Winnipeg Industrial Exhibition is held early in July, rather an unfavorable season to obtain much fruit from this Province. However, by holding over in cold storage a hundred cases of apples we have been able to make this fruit the main feature of our exhibit. To complete the display, cherries, gooseberries, raspberries and blackberries from the Niagara Peninsula have been sent forward in quantities from day to day during the ten days of the Exhibition, and have been sold to the people in the grounds as fresh fruit arrived. This has served the double purpose of allowing the westerners to taste the excellent qualities of our fruits and at the same time to keep up a creditable display.

One of the first classes in Ontario devoted entirely to box packing, held in Hastings County.

The Canadian National Exhibition in Toronto, two months later, comes at the season when our tender fruits are at their best and advantage is taken of this fact to display not only our early apples but also in abundance such fruits as the peach, pear, plum and grape. The past season a combined exhibit of fruits and grain was put up in the Horticultural Building and formed one of the most attractive displays among the many in that building.

Following later in the year the Horticultural Exhibition gives the best opportunity to advertise Ontario as the premier apple growing Province in the Dominion. The growers the past year, despite an unfavorable season, filled the Arena with apples, and the collections of this fruit, in all varieties and from all the leading districts, were away ahead of any display of its kind in Eastern Canada. The exhibits of boxed apples, over 3,000 in number, were with few exceptions admirably graded and packed, displaying a most wonderful improvement in the

use of this package over the first show of this Association held eight years previous, at which about a few dozen cases were on exhibit, not one of which, according to the judges, was properly packed.

The displays from the Demonstration Orchards conducted by this Department were features of the Exhibition, and proved beyond doubt that even in one season old orchards, hitherto neglected, can be made to produce the highest grade of apples.

LOCAL INSPECTION OF ORCHARDS.

Owing to the outbreak of Little Peach in the orchards of the Niagara Peninsula, special activity was evidenced in the local inspection there. A special officer of this Branch was detailed to supervise and instruct the local officers in the detection of this disease and Yellows and to see that the trees infected were promptly destroyed. Several thousand trees were condemned and burned and after continued inspection the coming season the orchards should be practically freed from present infection. Constant watchfulness will be necessary for the future if these and other diseases and pests are to be kept in bounds, and the growers in each municipality have it in their own hands under the present Act as to the selection of good men for the position of local inspectors.

Every municipality in the Niagara fruit belt appointed one or more inspectors, this Department bearing one-half the cost of their work. In addition the Department bore all the expense of supervision as mentioned above and the cost of inspection of nursery stock in the field and during fumigation. This required the services of one chief inspector, one expert in peach diseases and five assistants. Inspection for Brown Tail Moth was also carried on in conjunction with the Dominion Entomologist, Dr. C. G. Hewitt.

PROGRESS IN BEEKEEPING.

The advent of European Foul Brood into the Province at two points has compelled close inspection of apiaries and to cope with the situation the Department in 1911 appointed seventeen inspectors, the Province being divided into that number of districts with a chief inspector stationed at the Agricultural College, Guelph. As a result of the work of these men, who acted as instructors as well as inspectors, a great many apiaries were visited and the owners instructed in the treatment for disease.

Following up this work, apiary demonstrations were held in a great many places where the instructors met the beekeepers and discussed not only disease problems, but many other questions of interest to those engaged in the industry. These meetings were well attended and evidenced a keen desire on the part of the beekeepers to improve their methods. Indications point to the establishment of many new bee yards and a general forward movement in all districts in this industry, which is of so much importance to the fruit growers and alsike seed raisers.

DISTRICT REPRESENTATIVES.

Splendid progress has been made during the past year in connection with the work of the District Representatives of this Department, who also work in conjunction with the Department of Education. In my last report I gave a brief statement of the history, nature and objects of this plan and it will not be necessary to go over that ground again. It will be sufficient to say that the object is to get in close touch with the man on the farm, to render practical, expert assistance in the solution of farm problems and organizations and to thus help in rural development. The nature of the work continues to be as diversified as the manifold interests of rural life. I desire to refer briefly to a few of the leading lines of activity and from these a general idea of the work may be obtained.

First, I may record the fact that during the year offices were opened and permanent District Representatives were appointed at the following places:

Each District Representative has an office in a convenient place in the town in which he is located.

Orangeville, Dufferin.
Dutton, Elgin.
Markdale, Grey.
Newmarket, York.
Fort William, Fort William and district contiguous.
Sault Ste. Marie, Sault Ste. Marie and district contiguous.

This brings the total number or district officers up to twenty, nearly all of which are now supplied with assistants. In addition, men were located at Huntsville and Gore Bay, Manitoulin Island, for the summer. Provision was made for the appointment of a man in New Ontario, but a suitable man not being available, the appointment was deferred until next spring.

DEVELOPING THE COUNTY SPIRIT.

To my mind one of the most progressive and promising developments of the year has been the growth of the county spirit, as shown by special county organizations. Each county has advantages of its own, and if each resident can be made to realize this, it will be a good thing for the county and a good thing for the resident. Credit for first realizing this and putting the idea into concrete working shape belongs to Lambton county. Late in the year 1910, Petrolea and Sarnia councils co-operated in the calling of a meeting of delegates from each municipality, from Fruit Growers' Associations and Farmers' Institutes. Business men of the town and farmers of the country conferred, and the outcome was the Lambton Publicity Association, officered by leading citizens of the county. The County Council voted $1,000 for publicity work and a booklet was prepared, followed by a list of farms for sale. The opportunities in Lambton county for fruit raising, for vegetable growing, for mixed farming were made known throughout Great Britain and the United States. Splendid exhibits were made at Toronto Exhibition and the Horticultural Show to educate people nearer home. The result of this

Interior of office of District Representative.

co-operation between city and country has been thousands of enquiries from far and near. Land values have materially advanced, and as a natural consequence the people of Lambton county have been brought to realize the opportunities at their own doors and have been less anxious to leave than before. The process of breaking up big farms into smaller, more intensive farms has begun.

Somewhat similar action has been taken in Prince Edward County, where the Farmers' Clubs have formed a county organization under the name of the Associated Farmers' Clubs, of which our District Representative is Secretary. They have also set forth their advantages in a neat pamphlet, and are attracting new settlers and impressing those already on the land with the opportunities within their reach. Good progress is already reported.

In Waterloo County a year ago a convention of Farmers' Clubs was held and the formation of a county organization determined upon. The matter, however, was

left with the executive for a year. Plans have since been brought to a head and the first "County Board of Agriculture" makes its appearance. It aims to be to the country what the Board of Trade is to the town, and it will doubtless find great scope for usefulness.

These developments have been watched by other counties and the enquiries received indicate that many others will follow the example thus set.

FARMERS' CLUBS DO GOOD WORK.

In every county District Representatives have been instrumental in organizing several Farmers' Clubs, and in keeping these organizations engaged in energetic, beneficial work. In several counties the Club Secretary reports the meetings to the District Representative and thus keeps closely in touch. The District Representative, however, attends as many meetings as possible, both of the Clubs and the Institutes and delivers addresses. Individual clubs continue to accomplish concrete benefits for their respective districts, thus showing the advantages of combined action.

Farmers' club picnic.

In Durham County a Farmers' Club was instrumental in getting a station on the C. N. R., a few miles from Port Hope, thus saving time and money to their members. Three Farmers' Clubs revived the plowing match.

In Prince Edward Farmers' Clubs secured a new railway station, extensions of rural telephones and rural mail, purchased seeds co-operatively, interested Agricultural Societies in Field Crop Competitions. A Club, which organized into a Co-operative Association a year ago, has continued very successfully.

As an indication of the plans adopted by some of the Farmers' Clubs to retain the attention and command the activities of its members, I beg to quote the report of the Secretary of the Club at No. 5, Wilmot, submitted to our Representative in Waterloo County, where the Club movement has attained great proportions:

To the District Representative, Galt.

I have the honor to submit the following report:

The Farmers' Club and Debating Society of S. S. No. 5, Wilmot, was organized October, 1908.

Meetings were held every month during the fall and winter season in the schoolhouse.

A good supply of light was obtained by the purchase of four large burner bracket lamps, and recently four more have been added, making eight in all. The schoolhouse is a convenience for any public meetings and is generally used for such purposes.

An organ was rented at first. The School Board has since purchased an organ for the use of the school and Club. The organ has been of great service in assisting our orchestra and members, who have favored us with many solos, duets and instrumentals. The Maple Leaf Orchestra is worthy of mention. It consists of five members, and contains the organ, violin, bass viol, cornet and clarionet. Not only do the members of the orchestra favor us with three or four selections an evening, but are at all times ready to assist us in making up the programme with cornet and violin solos. The Glee Club, while not so well organized as the Orchestra, has helped materially in rendering an enjoyable programme. What is wanted to put the Glee Club on equal footing with the Orchestra is more material, which at present is not available.

The ladies—it is often said we couldn't do anything without them. At any rate, we have to give them great credit for what they have done in assisting our Club. They have at one time composed our whole programme committee. At our garden parties and picnics they were present with that willing hand to do all the work, and on our next programme, to be held Friday, December the first, there is to be a debate, in which all the ladies take part. This they have done, to say nothing of the recitations, speeches, duets and solos with which they are so generous.

The Club's aim is to create a social spirit in the community by drawing their neighbors out, interchanging ideas, and trying to place the science of agriculture in the position it should occupy in relation to the state. The order has always been good, which gives evidence of good citizenship.

Election of officers are held every three months, thus giving many of the members good training in the course of a year. A list of offices held are: President, Vice-President, Secretary, Convenor, and three for programme committee. We have been congratulated by a departmental speaker upon having our youngest members in the President's chair, besides taking an active part in the programme.

The average attendance at our meetings is about fifty-five, the maximum eighty. This attendance we consider very good when we take into consideration that the school is three miles from the nearest postoffice, which means many of our members have long distances to come, and hence those that are present are most enthusiastic members. Our object is to have every one take part in the work, for a great writer has said that "Personal participation is the great secret of exciting and maintaining a permanent interest in any undertaking."

The following is a list of subjects debated upon at our meetings:

"That travelling is a better method of education than reading."

"That mixed farming is more profitable than specialized farming."

"That commerce has done more for civilization than war."

"That the opening of the west has been an injury to the east."

"That intemperance causes more misery than war."

"That dairying is more profitable than beef raising."

"That the natural resources of Canada are greater than those of the States."

"That the world is made happier by the increase of wealth and luxury."

"That wheat has been more benefit to man than the cow."

"That banks, railroads, telephones and telegraphs should be owned and controlled by the Government."

"That ambition has done more harm than good to mankind."

"That universal adoption of Free Trade would be beneficial to all nations."

"That the British Empire has culminated and is now declining."

"That military drill should be taught in public schools of Canada."

"That eloquence is a gift of nature and cannot be acquired."

"That the west affords greater opportunity to the young man than the east."

"That the platform has wielded greater influence than the press."

"That the study of science on the farm involves more pleasure than the study of literature."

Addresses. We have been very fortunate in securing good outside talent. Hence the addresses on my list were very instructive.

"Preparation of Soil," illustrated on blackboard.

"Renovating and Care of Orchards."

"Seed Control Act." Many noxious weed seeds were produced for inspection.

"Illustrated address on the world's famous paintings."

"The Citizenship of Canada," oration.

"The attitude of the farmer in early settlement compared with the attitude of the farmer at the present day."

"Alfalfa," "Stock Exchange."

Current events given every meeting.

Impromptu discussion, "That the amount of land held by one family should be limited to one hundred and sixty acres." The next meeting we will have an address on "The Commission of Conservation" and the following meeting an address on "Bacteriology" by a silver medalist of Toronto University.

Two-minute Speeches. We think this is a very good method of getting young men or ladies to make their first appearance in public, as in a short speech they are able to prepare well, which is far better than a lengthy one unprepared. It is also good practice to have impromptu two-minute speeches for the more advanced members.

An Entertaining Evening. This was given by mixed members of the Society. A lengthy dialogue called "All in a Muddle" was a great success, drawing an overflowing audience. Out of eight meetings last year, five were debates, two addresses and one entertaining.

Judges and Critics. Very capable men have been secured by the Club to act in the capacity of judge and critic. Decisions of the judges have been rendered impartially and have been satisfactory to all.

Garden Party and Picnics. In previous summers enjoyable picnics were held. In the past summer a very successful garden party was given; no pains were spared to make it entertaining. We had an exhibit of pioneer implements. The programme consisted of selections by the orchestra, Mr. Witmer, the popular comedian, and addresses · local members, while about the grounds the different booths furnished their particular efreshments.

Club's Contribution for a Shield. King Edward and Lord Strathcona bought the copper from Nelson's famous battleship, and had it made into shields for the various associations who would in return make a contribution to the British Sailors' Association of disabled seamen. We have secured the shield, which is of very beautiful design, and have it placed in the school room.

Rural Mail Delivery. A committee was appointed and mapped out a route of twenty-three miles and have secured ninety-five per cent. of the route as petitioners. The matter is now before the Government, and its establishment will no doubt be of great benefit to the community.

Press Committee to attend to giving notice of meetings in four local papers. Holding the meetings once a month affords time for a notice one week and a report the next. Thus one half the issues contain some mention of the Club.

Finances. The receipts of the Club are made up in various ways. We have an annual ten cent membership fee. On special evenings a ten cent fee and occasionally a silver collection, besides receipts from the garden parties and picnics. The average receipts and expenditures for the last three years—Receipts, $44.97; Expenditures, $34.12—leaving a balance of ten dollars and over to commence the next season's work.

GOOD ORCHARDING PAYS.

In those counties where circumstances would permit, our Representatives either conducted or assisted in conducting demonstration orchards. They not only conducted them in accordance with the most up-to-date methods, but they gave public demonstrations of pruning, spraying, etc., for the benefit of the farmers of the neighborhood, large numbers of whom attended. The results constitute striking proof that good orcharding pays. In addition to these open air summer demonstrations, a large number of Fruit Institutes were held during the winter months

I beg to quote the results obtained in two orchards in different parts of the Province as showing the possibilities in the old orchards of the Province and incidentally indicating the benefits of this line of work.:

F. W. McCONNELL'S ORCHARD, COLBORNE, 1911.

117 trees in orchard, approximately 2½ acres.
Soil—light, sandy loam.
Orchard 32 years old.
Prices received in 1908—$300 for 300 lbs.
1909— 200 for 250 lbs.
1910— 100 for 73 lbs.
Not more than 50 per cent. were No. 1's in 1908, 1909 and 1910.

EXPENSES, 1911.

Scraping—7½ days at $1.50 per day		$11 25
Pruning—17 days at $2.00 per day		34 00
Painting—35 lbs. white lead at 7c.	$2 45	
2½ gals. raw linseed oil at $1.25	3 13	
Paint brush	0 20	
Time—1 man, 3 days at $1.50	4 50	
		10 28
Gathering Brush—1 man and 1 horse, 3 days at $2.25		6 75
Spraying—		
First—4 men, 14 hours, at $1.50 per day	$8 40	
Team, 14 hours, at $1.50 per day	2 10	
77 gals. lime-sulphur at 20c.	15 40	
		25 90
(Applied 7 gals. per tree, costing 21.5c. per tree.)		
Second—4 men, 11 hours, at $1.50 per day	$6 60	
Team, 11 hours, at $1.50 per day	1 65	
17½ gals. lime-sulphur at 20c.	3 47	
31 lbs. arsenate of lead at 13c.	4 03	
		15 75
(Applied 5 gals. per tree, costing 13.1c. per tree.)		
Third—4 men, 16 hours, at $1.00 per day	$9 60	
Team, 16 hours, at $1.00 per day	2 40	
24 gals. lime-sulphur at 20c.	4 80	
49 lbs. arsenate of lead at 13c.	6 37	
		23 17
(Applied 8 gals. per tree, costing 19.3c. per tree.)		
Total cost of spraying per tree, 53.9c.		
Manure—25 tons barnyard manure at $1.00		25 00
Fertilizer—500 lbs. muriate of potash at $2.50	$13 00	
1,000 lbs. acid phosphate at $1.10	11 00	
Applying fertilizer	1 00	
		25 00
Plowing—1 man and team, 2 days at $3.00		6 00
Cultivating—1 man and team, 4 days at $3.00		12 00
Cover Crop—1 man and team, 1 day, preparing seed bed	$3 00	
¾ bus. clover seed	4 50	
		7 50
Total expenses of caring for orchard		$202 60

RESULTS.

Fall—	No. 1.	No. 2.	Total.
Holland Pippin	24	2	26
Colverts	4	..	4
Red Pippin	1	..	1
Early Harvest	2	..	2
	31	2	33

Winter—	No. 1.	No. 2.	Total.
Greenings	124	10	134
Golden Russet	85	11	96
Spy	6	1	7
Wagener	13	9	22
Snow	25	7	32
Wallbridge	1	1	2
Canada Red	5	0	5
	259	39	298

Culls and windfalls, 800 lbs.

Total number of barrels—No. 1's	290	
2's	41	
		331

Percentage of No. 1's, 87.6 per cent.		
33 barrels Falls at $2.50	$82 50	
298 barrels Winters at $3.25	968 50	
800 lbs. culls and windfalls at 50c.	4 00	
		$1,055 00
Expenses of barrels, picking, packing, and manager's commission, 331 barrels at 95c.		314 45
Receipts from apples		$740 55
Expenses		202 60
Profit		$537 95

Net profit per acre, $215.18.

Accounts of the last four years received from Mr. E. B. Hallman, New Dundee, Waterloo County. Orchard of 70 trees, 60 of which bore fruit in 1911.

1908.

Total yield about 66 bbls.		
Sold 60 bbls. for	$156 32	
No account of work, etc.		
Reserved 6 bbls.		

1909.

Sold in Berlin, etc., 17 bbls.	$33 95	
Shipped to Dominion Fruit Exchange, Ottawa, 122 bbls. at $2.00 to $2.50	275 00	
Paid for bbls., $17.94; packing, $5.00		$22 94
Balance		286 01
	$308 95	$308 95
No account of work, etc.		
Reserved, 6 bbls.		

1910.

Sold in Berlin, 45 bbls.	$108 15	
No account of work, etc.		
Reserved 6 bbls.		

1911.

To scraping and pruning, 3½ days	$5 25	
" Spray pump, half share	8 50	
" 1 bbl. lime-sulphur	7 20	
" 50 lbs. arsenate of lead	5 50	
" Freight	2 20	
" Plowing, 1½ days, at $2.50	3 75	
" Cultivation, 4 days, at $2.50	10 00	
By limb wood for fuel		$1 00
To seed oats, 3 bushels at 40c.	1 20	
" Sowing 1 hour (by hand)	0 15	
" 20 days picking, at $1.50	30 00	
" 30 bbls. at 38c.	11 40	
" 20 bbls. at 25c. (second hand)	5 00	
" Packing and grading	5 00	
Sold 175 bbls. for		541 00
Value of 23 bbls. ciders at 25c. per cwt.		7 50
Reserved 7 barrels at $3.00		21 00
Net profit	475 35	
Value of crop, 60 trees	$570 50	$570 50

In view of such results, it is not surprising that carloads of spraying material are now going into counties where its use was unknown a few years ago.

CO-OPERATION IS ENCOURAGED.

Co-operation is being materially advanced by the District Representative work. Quite a number of Farmers' Clubs have undertaken the simpler forms of Co-operation as represented by the purchase of seed. In Lanark County 63 members of a club buy their grass and clover seeds, corn and tile co-operatively, emphasizing always the matter of quality. In Prince Edward a Co-operative Fruit Growers' Association, started a few years ago, continues to flourish and others are being formed. The Durham Fruit Growers' Association was formed and 35 members sold about 5,000 barrels of apples for twice as much as they had previously received. That the owner shall properly care for his orchard is always one of the conditions of membership in these Associations, and the effect on the quality as well as quantity is remarkable.

Demonstration poultry house.

In Ontario County a special effort has been made to organize poultry circles with a view to improving the conditions surrounding the marketing of eggs. Five Circles have been organized, their membership varying from 15 to 90 members. The smallest circle (with the exception of the circle of 15 members, which has been organized only recently) has marketed an average of some 200 dozen eggs weekly for six months commencing with April. The largest circle had an average business during the same period of 850 dozen weekly, going as high as 1,050 dozen during the period of heavy production. The advance in price to the farmer beyond what it would have been had there been no circles was during this time about three cents per dozen. During the fall and winter the circle price of eggs has been from 10 to 20 cents a dozen above the price that would have ruled ordinarily. A demonstration poultry house has been built and loaned to an active member of one of the circles, and is operated under the supervision of the representative, and is for demonstration purposes.

Egg collector gathering eggs from Ontario County egg circles.

FERTILIZER EXPERIMENTS.

Nearly all the Representatives have conducted small experimental plots. These have been used, among other things, to make tests as to the value of commercial fertilizers. I will quote a couple of illustrations to show the results obtained. The following are the figures of the Prince Edward County experiments with fertilizer on tomatoes, conducted on large plots:

Plot No.	Fertilizer used per acre.	Yield per acre.	Increase per acre.	Cost of fertilizer per acre.	Value of tomatoes per acre.	Profit.	Deducting cost of fertilizer.
				$ c.	$ c.	$ c.	$ c.
1	No fertilizer	243 bus.	.....	.....	62 22	.....	.....
2	150 lbs. Potash..... 150 " Nitrogen ... 375 " Phosphate .	343 bus.	100 bus.	10 42	94 32	32 10	21 68
3	150 lbs. Nitrogen ... 375 " Phosphate .	293 bus.	50 bus.	6 97	80 57	18 35	11 38
4	150 lbs. Potash ..... 375 " Phosphate..	280 bus.	37 bus.	6 45	77 00	14 78	8 33
5	150 lbs. Potash..... 150 " Nitrogen...	270 bus.	27 bus.	7 42	74 25	12 03	4 61

School pupils visiting an Experimental Plot.

GETTING PUBLIC SCHOOLS INTERESTED.

Although their actual teaching is confined to High Schools and Short Courses, the District Representatives are doing much towards getting the Public Schools interested in agriculture. This is being done in various ways, as the local conditions seem to justify.

Hastings is one of the counties which illustrates this. Competitions have been carried on among a number of schools in the making of weed collections. Attention is called to the 23 weeds coming under the Seed Control Act, and students are urged to collect, press and mount specimens of these. A competition is then held at the District Teachers' Convention and the school making the best exhibit is awarded the prize. Each school must exhibit at least twelve collections

and the prizes range $7, $5, $3, $1.50. In each case the teacher must certify that the work has been done by the pupils without neglect of their regular school work. Such competitions followed up by addresses at the Teachers' Conventions on agricultural education have the double advantage of interesting both the pupils and teachers in agricultural work, and it has been such a success that it is being continued next year.

In many counties school gardens and elementary agriculture generally have been given an impetus. In Norfolk County seven schools entered in a rural poultry competition. Each of the children was given a setting of eggs from a laying strain of pure bred Barred Rocks, accompanied by instructions as to the best methods of caring for poultry.

Educational exhibit of the District Representative is now a familiar feature at many fall fairs.

In Waterloo County the work has been organized on township lines, and last year all the schools in North Dumfries, ten in number, joined in the growing competitions, which culminated in a special township fair. Good strains of good varieties of grain and vegetables are distributed among the children, who do the planting and cultivating on the plots at home. These plots were inspected during the year by the District Representative, and in the fall a fair was held at a centrally located school, at which exhibits of cleaned oats and barley, potatoes and corn were made. Prizes were awarded for the four plots which showed the most care and interest on the part of the pupils. Other prizes were awarded, as follows:

Oats, Lincoln, 12 prizes—$1.00, 95c., 90c., 85c., etc.
Barley, O. A. C., 21, 10 prizes—$1.00, 95c., 90c., etc.
Potatoes, Empire State, 30 prizes—$1.00, 95c., 90c., 85c., etc.
Sweet Corn, Golden Bantam, 25 prizes—$1.00, 95c., 90c., etc.

	1st	2nd	3rd	4th
Oats, seed from last year's plot	$1 00	$0 75	$0 50	....
Barley, seed from last year's plot	1 00	0 75	0 50	....
Potatoes, seed from last year's plot	1 00	0 75	0 50	....
Care of plot	1 00	0 75	0 50	0 25
Collection of weeds	1 00	0 75	0 50	0 25
Collection of weed seeds	1 00	0 75	0 50	0 25
Collection of insects	1 00	0 75	0 50	0 25
Junior Essay	1 00	....	....	....
Senior Essay	2 00	....	....	....

This, I believe, is the very best way in which agriculture can be taught in the public schools and children interested in rural life.

WORK AT FALL FAIRS.

The fall fairs are now being put to good advantage for educational purposes. Nearly all the District Representatives made exhibits at the fall fairs in their county. These exhibits consist of weeds, seeds, pruning and spraying material, and many other things of practical interest to the farmer. The tents where these are displayed attract many visitors who carry away pamphlets, bulletins, etc. But probably an even greater educational feature is live stock judging competitions among the young men. Classes in all kinds of live stock are given, and as many as 26 young men have participated in one competition, while 12 to 15 is very common. Live stock is brought into the ring and a talk given on the general characteristics of the class under consideration. Then the farmers' sons are given 25 minutes to place the animals and give the reason for the respective positions in which they place them. Sixty per cent. is given for correct placing and forty for good reasons. The judge then reviews the result. This plan is arousing great interest among farmers' sons.

NEW ORGANIZATIONS.

Assistance has been rendered in bringing into existence several new organizations for agricultural work.

In the east the "Belleville District Holstein Breeders' Club" makes its appearance. It includes the breeders of this particular type of cattle in the counties of Prince Edward and Hastings. The object is to secure an improvement in the standard of live stock.

The Menie District Ayrshire Breeders Club was organized at Campbellford. The objects are defined as being the promotion of good fellowship among breeders and the advancement of Ayrshire interests by the holding of sales by auction, by encouraging record keeping, discussing the best methods of breeding and "to act in unison on all occasions which demand it."

The Hastings County Beekeepers' Association, the Northumberland Beekeepers' Association, several plowing match associations, numerous Farmers' Clubs, Field Competitions and Women's Institutes all owe their existence to the District Representatives and are doing excellent work for agriculture.

Then, too, a new crop is being encouraged in Prince Edward in the form of tobacco, the growing of which has heretofore been almost entirely confined to the south corner of the Province. During the past two or three years two or three farmers in Prince Edward County have grown a little and found it very profitable. Much information has been given, and as there is a good market available, it is expected many others will take advantage of it.

MUCH MISCELLANEOUS WORK.

While these have been a few of the lines of work followed and a few of the results obtained, there were many other things accomplished which it is scarcely possible to enumerate. Drainage surveys have been made by the dozen, Farmers' and Women's Institute meetings addressed, Short Courses held, demonstrations have been given in the naming and spraying of weeds, Agricultural Societies have been assisted, cow testing encouraged, thousands of bulletins were distributed and newspaper articles disseminated. The great strength of the work continues to be in the personal contact between the Representative and the man on the farm. The local office of the Representative becomes the Mecca of all the organized agricultural activity of the district and scores of farmers call, especially on market day, to get information and advice. Then, too, as far as possible the Representative goes out into the country and meets the man on his own farm and thus helps him to work out his problems.

For all these reasons I have no hesitation in saying that this system of agricultural education and assistance is realizing results vastly beyond anything that could be accomplished by demonstration farms or many other plans often suggested.

These massive pylons, each 40 feet high, were erected by the Ontario Government in Whitehall, immediately opposite Downing Street, on the route of the Coronation Procession of their Majesties King George V. and Queen Mary, 22nd June, 1911. Through the courtesy of Scotland Yard officials this photo was taken just prior to the arrival of the procession on its way to Westminster Abbey.

COLONIZATION AND IMMIGRATION.

It is difficult indeed to set down in figures the results of the year's work in connection with colonization and immigration, but the propaganda for settlers, including domestic servants, has been prosecuted with vigor and the records of the Branch constitute a partial statement of the results. These records contain the following figures:

Number of immigrants sent to farms by Bureau of Colonization	2,536
" " farm laborers sent to farms by Salvation Army	1,431
" " other immigrants brought to Ontario by Salvation Army	2,782
" " domestics placed by Salvation Army	257
" " domestics given twenty-four hours' accommodation at the Women's Welcome Hostel	1,053
" " domestics on whom the $5 bonus was paid	1,357
Total	9,416
Less duplicates included in above	387
Net total	9,029

Although this represents a gratifying increase over last year, there is good reason to believe it does not represent much more than half the total addition to the population as a result of the work being carried on. The Canadian Northern reports that 3,025 immigrants were booked to Ontario destinations over their steamship line. The records of our London Office, as will be seen below, show that over 5,000 people left for this Province. Neither of these items are included in the above, in order to avoid possible duplication. It is certain, however, that many who have arrived have gone direct to friends or have been employed on arrival of the boat or before they have proceeded very far therefrom, and thus would not pass through the hands of our officers on this side.

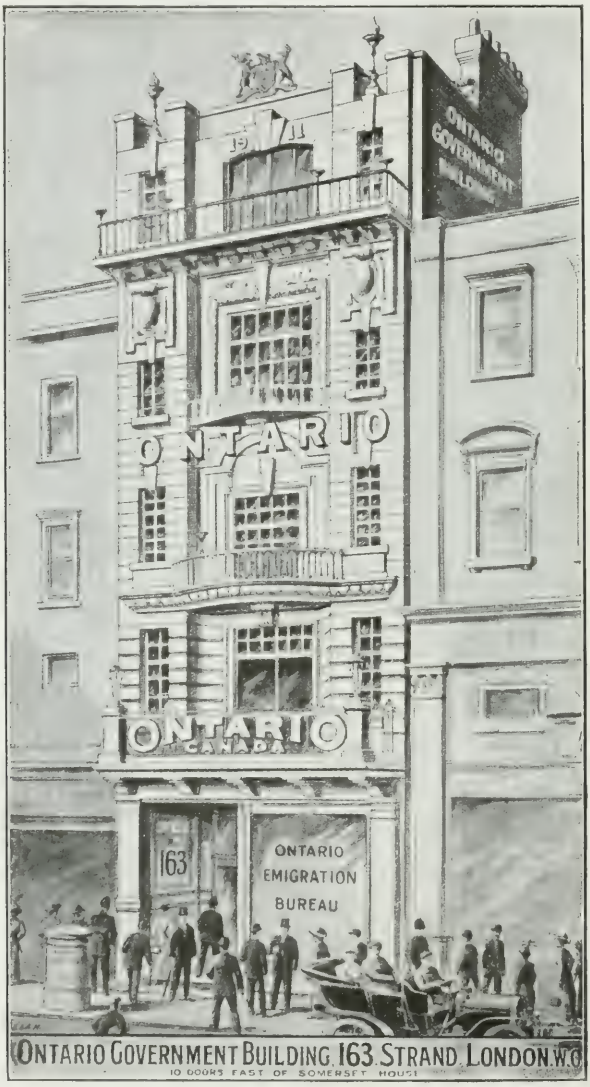
The general supervision of this work, including the placing of the men, has been looked after by this Branch. I regret to report that the supply of farm labor is yet too small to meet the demand. One big difficulty appears to rise from the fact that so many of our farmers are able to employ their men only for six or eight months, thus leaving them to drift to the cities or elsewhere for the balance of the year. This means the farmer must start all over again to secure his help in the spring. If the work on the farm could be so arranged as to give employment the year round, it would go a long way toward solving the help problem. With this object in view at least one County Council is moving in the direction of putting up money to advance to men with families, as it is felt they make the most desirable and most permanent settlers. Moreover, the women and children can find plenty of employment in the fruit and vegetable season.

LONDON OFFICE.

The year has been one of increased activity in the work of our office in London, England, in spite of the inconveniences inseparable from building operations.

Early in the year work was begun on the remodelling of the office in accordance with the appropriation made for this purpose at the last session of the Legislature. Temporary quarters were secured a few doors east and business was carried on with as little inconvenience as was possible under the circumstances. A lease of

the site having been secured until 1950, the structure itself was completely overhauled and we have now a building which does credit to the growing importance of this Province in London, and at a cost exteremly moderate compared to the amounts spent on similar enterprises by Victoria and other States of the Australian Commonwealth. Although the frontage is not great, it is five stories in height, the space being economically arranged with a view to serving prospective settlers



and investors and incidentally also many visitors from this Province who may be in London. Situated as it is on perhaps the busiest thoroughfare in the world, the splendid window display of Ontario products is in itself a tremendous advertisement for the possibilities of this Province, being viewed by thousands of persons daily.

During the Coronation celebrations building operations were in progress but notwithstanding this, arrangements were made to place both the main building and the temporary quarters at the disposal of Ontario visitors for the purpose of

viewing the Royal Progress through the City of London on the day following Coronation. It constituted one of the best points of vantage in the entire metropolis and Ontario's hospitality was appreciated by upwards of two hundred visitors. In addition, this Province contributed to the general expressions of homage to their Gracious Majesties by the erection of pylons on Parliament Street near Trafalgar Square, along which the Royal Party passed on the way to Westminster Abbey. The original intention was to have these pylons opposite our office on the Strand, but the London County Council which regulates such matters declined to grant permission. However, they were in an equally prominent position and Ontario's action in this regard elicited favorable comment on all sides.

The work of the office was considerably interfered with by the action of the Dominion Government in issuing a circular announcing that no bonuses would be paid on immigrants booked to Toronto. This circular was issued under date of July 5th. As the booking agents who sell the tickets to immigrants naturally desire to collect this bonus, it meant that they booked them to such points as were recognized by the Dominion Government. Toronto being the central point of distribution for the Ontario Government, it worked out to be a considerable handicap on our work. However, I am confident that an agreement will be arrived at with the Dominion authorities by which this handicap will be removed.

BIG INCREASE IN BUSINESS.

In spite of these variations in the usual run of things, the records of the office contain many proofs of the increased attention which Ontario is attracting. The number of callers seeking information aggregated over 14,000 and the number of pieces of literature distributed over a million and a quarter. The correspondence of the office increased by over 75 per cent., outward letters numbering 15,135, and inward 14,487. Enquiries were received not only from all parts of Great Britain, but also from almost every country in Europe.

As to actual settlers, the records also show a big increase. The following are figures for London and Belfast:

London—		
Males	2,751	
Females	1,738	
		4,489
Belfast—		
Males	428	
Females	276	
		704
Total		5,193

All our efforts are directed to influencing males who are willing to go on the land and females who are willing to accept domestic service. These two classes make up the great bulk of these figures. But where immigrants express a determination to come to Ontario for other purposes we cannot do less than give them any information or assistance possible. This class, however, comprises only a small percentage of the total.

It is estimated that these settlers brought with them capital to the extent of $700,000.

ASSISTED PASSAGES.

Last session the sum of $20,000 was voted for the purpose of advancing part of the passage money of those who gave promise of being desirable farm laborers or domestic servants. This money was handled through the London Office, and

was apportioned through various agencies as follows: Salvation Army, $6000; Canadian Northern, $3000; Canadian Pacific, $3000; Grand Trunk, $3000. It was decided payments should be made to an average extent of $20 each. The sums actually paid out were:

	Domestic Servants.	Farm Laborers.	Total Amount.
Salvation Army	308	..	$5,995 73
Canadian Northern	79	66	2,727 35
Canadian Pacific	39	16	1,028 32
Grand Trunk	50	93	2,786 12
London office direct	66	131	3,675 72
Total	542	306	$16,213 24

This plan of assisted passages was adopted in 1910 as an experiment in an effort to meet the great need there is for both farm laborers and domestic servants. The results so far will, I believe, be accepted as being quite satisfactory, and good progress is being made with the repayments.

Interior of car filled with grains, vegetables, etc., which visited many parts of Old Ontario in order to show the people the possibilities of New Ontario.

SETTLING NEW ONTARIO.

Never before did New Ontario receive so much attention as during the past year. The propaganda under the direction of this Branch has been carried on with increased vigor, and I am glad to see the matter is also being taken up by Boards of Trade and other bodies throughout the Province. The widespread interest is shown by the fact that seventeen thousand letters have been received and answered and thousands of descriptive pamphlets sent out. A judicious news-

paper advertising campaign has been carried on. These methods are now being supplemented by sending a demonstration car through the older settled portions of the Province. The idea is not to persuade anyone to leave Old Ontario, but to show those who have thought of doing so that as great opportunities await them in the vast new districts in their own province as are to be found anywhere on the continent. With this idea in mind a car has been fitted up with samples of grains, roots, vegetables, etc., grown in that country, in order to prove conclusively the fertility of the soil. The car has been visited by hundreds of people at every stop and the people have given every indication of being much impressed by what they have been shown and what they have been told by those in charge.

During the year, 2366 settlers' railway certificates were issued by this Bureau. Another indication that there has been a material increase in population is contained in the following record of settlement kept by the T. & N. O., which continues to do splendid work in opening up the Temiskaming district:

42 took up land near North Bay—about 4,200 acres.
262 took up land in the townships around Liskeard—about 41,800 acres.
294 took up land in the townships near Englehart—about 45,200 acres.
185 took up land around Matheson—about 29,600 acres.
170 took up land around Cochrane—about 27,200 acres.

This of course is only a partial list of the settlers who went in during the year.

DEMONSTRATION FARM.

Good headway has been made both with the clearing and cultivation of the Demonstration Farm at Monteith. Sixty acres have now been cleared and stumped and are ready for crops next year. During the past season some thirty-eight acres were sown to grass, wheat, oats, peas, barley, alfalfa, potatoes, turnips. The dates of sowing and harvesting and the yield per acre is given as follows:—

——	Variety.	Sown.	Harvested.	Yield per acre.
Oats	Irish Victor	May 6	Aug. 19	60 bus.
	Abundance	" 6	" 6	50 "
	American Wonder	" 6	" 9	45 "
	Sensation	" 13	" 19	40 "
	1000	" 13	" 19	50 "
	Irish White	" 13	" 19	55 "
	Golden Dewdrop	" 13	" 19	75 "
	White Marvel	" 13	" 19	55 "
	Sheffield	" 13	" 19	45 "
	Black Tartarian	" 16	" 19	39 "
Fall Wheat	Golden Chaff	Aug. 29, 1910	Aug. 7, 1911	25 bus.
	Early Windsor	" 29, 1910	" 7, 1911	27 "
Spring Wheat	Goose	May 13	Aug. 19	30 bus.
	White Russian	" 13	" 19	25 "
	Scotch Fife	" 16	" 19	26 "
Barley	O. A. C.	May 16	Aug. 23	35 bus.
Peas	Blue Imperial	May 16	Sept. 11	30 bus.
	Canadian Beauty	" 16	" 11	25 "
Potatoes	Carman No. 1.	May 24	Oct. 2	80 bags
	Early Ohio	" 27	" 2	50 "
	Eureka	" 27	" 3	80 "

It is expected that during the coming season potatoes and peas will be grown more extensively, the soil being particularly adapted to these crops.

FACTORY INSPECTION.

Under the direction of this Branch the inspection of industrial establishments is carried on, and the following is a report of the work done during the fiscal year ending October 31st.

There were 8,523 inspections made during the past year in 458 cities, towns and villages. Of these, 337 were made exclusively in connection with enforcing the Stationary Engineers' Act in places that did not come under the Factories Act, and the requirements of the Stationary Engineers' Act were also pointed out by the inspectors to every steam user in the course of their regular inspections.

In the following table is shown the variety of places inspected and the number of inspections made in each place:

Agricultural Implements	64	Stationary Engineers	337
Brick and Tile Works	125	Flax, Twine and Cordage	20
Cotton	34	Tobacco	55
Clothing	1,114	Woodworking Trades	449
Chemicals	82	Woollens and other Textiles	224
Conveyances and Accessories	73	Bakeshops	403
Food	544	Confectioners	214
Glass	23	Boots and Shoes	53
Metals, Iron Founding, etc.	160	Drugs	56
Iron, Mfg. of	348	Dry Goods	249
Silverware	5	Fancy Goods	63
Laundries	192	General Stores	66
Laundries, Chinese	661	Groceries	129
Leather and Leather Goods	204	Hardware	33
Locomotive and Car Shops	42	Jewellery	31
Lumber	524	Stationery, Books and Music	33
Machinery	131	Miscellaneous	942
Paper and Paper Trades	416	Millinery	199
Packing Houses	13	Tailors	206
Rubber and Gutta Percha	16		

In these factories and shops there were 220,772 employees. Four thousand one hundred and fifteen recommendations were made by the inspectors, dealing with the following subjects: Boiler inspection, child labor, cleanliness, elevators, fire escapes, mode of wearing the hair, guards for machinery, hours of labor, sanitation, seats (for females), ventilation, miscellaneous. A large proportion of these recommendations have been complied with.

The work of inspection has been attended with very good results, brought about in certain cases by having resorted to the Courts, but on the whole there has been comparatively little friction in having both our recommendations and the law carried out. The Branch has been in close communication with factory inspection departments in older countries, who have had a senior experience, which has resulted in obtaining many perfected ideas relating to the testing of air and suction pressures, both of which are very useful in determining impurities in the air in a workroom. We have also about perfected a regulation for the safety of retorts used under steam pressure in canning factories.

The fumes that rise from wood alcohol when used for commercial purposes have caused us to make special enquiries in order to provide a remedy that will protect the health of employees. The question, too, of lead poisoning caused by inhaling fumes from linotype machines required a special investigation, which resulted in finding a remedy that will protect operators from being obliged to work in this atmosphere.

In accordance with the legislation of last Session, the inspection of several hundred Chinese laundries throughout the Province was undertaken. This necessitated having the most salient features of the Factories Act translated from English into the Chinese language, so that they might be better understood, and in consequence the laundry premises are much improved, even though the improvements called for some financial outlay.

Members of the staff attended recent Conventions held in Chicago and Lincoln, Neb. The reports indicated that missionary work, together with efficient inspection, was doing a great deal towards preventing serious accidents, but it appeared that minor accidents had not decreased in the same ratio.

About 4,000 reports are sent out annually from this Branch to manufacturers operating plants with machinery.

STATIONARY ENGINEERS' BRANCH.

In this Branch is directed the work of issuing certificates to all stationary engineers operating stationary steam plants of 50 h.p. or over and carrying over 20 lbs. pressure throughout the Province of Ontario. Considerable work is detailed in examining the engineers, and renewing their certificates each year.

The Stationary Engineers' Act is not only for safeguarding life and property, but assists to educate the engineers and thus make their services more valuable to their employers. The Factory Inspectors, while on their trips inspecting the different factories throughout the Province, reported that a great number of cases where plants which came within the meaning of the Act were operated by uncertificated engineers, and in this way added a considerable number to our list of examination candidates.

During the last twelve months, 1,149 engineers were examined by the members of the Board, and as a small percentage only failed to pass the examination, the number of certificate holders in Ontario has increased to almost 7,000. The cities throughout Ontario are visited at least twice each year by a member of the Board for the purpose of conducting examinations for engineers' certificates.

The manufacturers also have given the Board considerable assistance in the carrying out of this Act, and as far as is known not one fatal accident has occurred in the Province since the Board of Stationary Engineers was given power to enforce the Act.

All of which is respectfully submitted,

JAS. S. DUFF,

Minister of Agriculture.

THIRTY-SEVENTH ANNUAL REPORT

OF THE

Ontario Agricultural College

AND

Experimental Farm

1911

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO)

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty
1912.

Printed by
WILLIAM BRIGGS,
29-37 Richmond Street West,
TORONTO

To the Honourable COL. SIR JOHN MORISON GIBSON, K.C.M.G., etc., etc., etc.,
Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

The undersigned begs to present for the consideration of Your Honour the Report of the Ontario Agricultural College and Experimental Farm for 1911.

Respectfully submitted,

JAMES S. DUFF,

Minister of Agriculture.

TORONTO, 1912.

THE ONTARIO AGRICULTURAL COLLEGE, GUELPH.

HON. JAMES S. DUFF, *Minister of Agriculture, Toronto.*

FACULTY OF INSTRUCTION, 1911-1912.

(All except the President arranged in order of Seniority.)

G. C. CREELMAN, B.S.A., LL.D. ..... President.
H. H. DEAN, B.S.A. ..... Professor of Dairy Husbandry.
C. A. ZAVITZ, B.S.A. ..... Professor of Field Husbandry.
J. HUGO REED, V.S. ..... Professor of Veterinary Science.
H. L. HUTT, B.S.A. ..... Professor of Landscape Gardening.
G. E. DAY, B.S.A. ..... Professor of Animal Husbandry.
J. B. REYNOLDS, B.A. ..... Professor of English.
R. HARCOURT, B.S.A. ..... Professor of Chemistry.
MISS MARY URIE WATSON ..... Director of Home Economics.
JOHN EVANS ..... Professor of Manual Training.
S. F. EDWARDS, M.S. ..... Professor of Bacteriology.
C. J. S. BETHUNE, M.A., D.C.L. ..... Professor of Entomology and Zoology.
W. R. GRAHAM, B.S.A. ..... Professor of Poultry Husbandry.
W. H. DAY, B.A. ..... Professor of Physics.
E. J. ZAVITZ, B.A., M.S.F. ..... Professor of Forestry.
J. W. CROW, B.S.A. ..... Professor of Pomology.
J. E. HOWITT, M.S.Agr. ..... Professor of Botany.
R. W. WADE, B.S.A. ..... Associate Professor of Animal Husbandry.
T. D. JARVIS, B.S.A. ..... Associate Professor of Entomology and Zoology.
MISS ANNIE ROSS, M.D. ..... Lecturer in Physiology, Nursing, Psychology, and Child Study.
H. H. LEDREW, B.S.A. ..... Lecturer in Economics.
D. H. JONES, B.S.A. ..... Lecturer in Bacteriology.
WM. HUNT ..... Lecturer in Floriculture.
MORLEY PETTIT ..... Lecturer in Apiculture.
MISS GRACE GREENWOOD ..... Instructor in Normal Methods.
E. W. KENDALL ..... Lecturer in Manual Training.
L. CAESAR, B.A., B.S.A. ..... Lecturer in Fungus Diseases and Insects.
W. J. SQUIRRELL, B.S.A. ..... Lecturer in Field Husbandry.
H. L. FULMER, B.S.A. ..... Lecturer in Chemistry.
W. A. MCCUBBIN, M.A. ..... Lecturer in Botany.
MISS E. C. DWIGHT, B.A. ..... Acting Librarian.
MISS M. A. PURDY ..... Demonstrator in Chemistry.
G. H. UNWIN, B.S.A. ..... Instructor in English and German.
MISS JEAN RODDICK ..... Instructor in Domestic Science.
MISS ALTA DICKEY ..... Instructor in Domestic Art.
MRS. F. DOUGHTY ..... Demonstrator in Domestic Art.
R. R. GRAHAM, B.A. ..... Demonstrator in Physics.
MISS MARY MCLENNAN ..... Demonstrator in Domestic Science.
A. H. MCLENNAN, B.S.A. ..... Demonstrator in Pomology.
ALEX. MCKAY ..... Demonstrator in Cheese Making.
G. RICKWOOD ..... Demonstrator in Cream Separators and in Butter Making.
N. S. GOULDING ..... Demonstrator in Milk Testing and Soft Cheese Making.
J. SPRY, B.S.A. ..... Demonstrator in Physics.
A. J. GALBRAITH, B.S.A. ..... Demonstrator in Chemistry.
A. W. BAKER, B.S.A. ..... Demonstrator in Entomology.
MISS G. WALSH ..... Demonstrator in Laundry and Household Administration.
S. H. HOPKINS ..... Instructor in English, and Resident Master.
G. P. MCKAY, B.A. ..... Fellow in Chemistry.
H. S. RINGLAND, JR. ..... Instructor in Athletics.

COLLEGE OFFICERS.

S. SPRINGER ..... Bursar and Superintendent.
S. H. GANDIER, B.S.A. ..... Secretary.
W. O. STEWART, M.D. ..... Physician.
MRS. K. FULLER ..... Superintendent, Macdonald Hall.
MRS. CUNNINGHAM ..... Matron, Agricultural College.

ONTARIO AGRICULTURAL COLLEGE
AND EXPERIMENTAL FARM.
1911.

To the Honourable the Minister of Agriculture.

SIR,—I have the honor to submit herewith the thirty-seventh annual report of the Ontario Agricultural College and Experimental Farm, including the report of the Macdonald Institute, for the year 1911.

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Respectfully submitted,

G. C. CREELMAN,

President.

Ontario Agricultural College.

PART I.

THE PRESIDENT.

Last year we recorded an attendance of 1,386, which was ninety more than the year previous. This year, in all classes, our total was 1,557 separate individuals, who attended shorter or longer courses at this College. Students going back, as they do, largely to our farms and farm homes should have a very marked effect on the future of Ontario agriculture.

The Short Courses, in particular, have been well patronized and highly appreciated by the farmers in attendance. Hundreds of men come to these courses, living in the city of Guelph for two or four weeks, each morning at eight o'clock coming regularly to class work, remaining until it is dark at night, and then returning again after supper to pursue the work until bed-time. Again in the month of June our farmeers come back to see the results of our spring planting. and the intelligent questions asked and the intense interest manifested give us courage to go forward with the work along all lines.

As usual, students have come to us this year from all parts of the world. Every continent is represented, and we have individuals from the white, black, and yellow races.

Agricultural Education.

One would think that during all the years that this College has been in active operation, with the thousands of students who have attended the several courses, the work of the Experimental Union, and the activities of the various organizations throughout the country, that all the best known methods would be in operation on every farm and that the mere elements of the Science of Agriculture would no longer need to be discussed. As a matter of fact, however, it would appear as though we were moving very slowly. Many a farmer, yet, fails to understand his soil, its deficiencies and needs, any better than his father or his grandfather did. He does not care any better for his manure pile, and he is no more alive to the necessity of keeping out noxious weeds. There is this marked difference, however, the farmers generally are no longer indifferent to the value of education, and our country audiences are larger and more appreciative than ever before. The fault, then, would appear to be in the application of the truths that have been taught.

Agricultural Representatives.

For forty years we have been asking more from the graduates of the Agricultural College than from men receiving degrees in our professional institutions. We are all agreed, as indicated by the common practice, that graduates in medicine, law, and theology must, on leaving college, go immediately into practice and give to the people, for a consideration, the benefit of their opinions, on the subjects which they have for four or more years, been perfecting themselves. We have not

for a moment expected the lawyer, the preacher, or the doctor to return to the old homestead and there, within four walls or inside the fences of the one hundred acres, make such a reputation for wisdom, for the saving of souls, or the healing of the sick, that persons needing such help will come there for it, and yet this is just what we are expecting of the graduates of our agricultural colleges. We are expecting them to take a run-down business and build it up, to make a success of it by personal effort, and at the same time, without sign or hope of financial assistance from any one, to so impress the neighborhood that better farming will become the rule in that district. Have we stopped to think of this side of the question?

What the Colleges and Experimental Farms Have Done.

Agricultural Colleges and Experimental Farms, both in this and other countries, have done and are doing good work. Experiment Stations have proven which are the best crops for each Province, and the Colleges have taken the information and given it to their students in attendance. No thinking man can refute the statement that the Experimental Farm at Guelph has already published and spread broadcast enough specific information to double and treble our annual farm output, if such information were put into practice. It is not for us to criticize the present methods of work. The Agricultural Society, the Farmers' Institute, the Grange, the Farmers' Club, and the different Provincial Associations—Dairying, Fruit Growing, Poultry Raising, and Bee-Keeping, and so forth—have all been and are doing immense good and must be encouraged: but the fact still remains, and stares us always in the face, that such efforts are more or less spasmodic at best and serve the purpose of the revival meeting in church life. Such methods can in no way be expected to look after the backslider, much less the man who does not attend such meetings at all.

The Remedy.

I believe, then, we are on the right track when we place a College Graduate in Agriculture in a community and tell him to go to work. The important thing is that he spend all of his time in the interests of the people whom he is serving and devote all of his energy and ability to improving farm conditions in his neighborhood. The men so far appointed now number twenty, and they are the busiest men in the whole country; with their office on the main street, their laboratory in the high school, and their constant trips into the farming community, spending some time on each farm, are all means to an end, and the results are already showing in each community.

Perhaps in the past no body of men were harder to move than a County Council, and yet, of their own free will, one Council in this Province has, during the past year, voted a bonus of $750 to one of our representatives, in addition to his regular salary.

In any one of the districts in which these men are found, we find Farmers' Clubs being organized, young men holding regular meetings in the interests of their business, orchard demonstrations going on, Co-operative Societies being formed: in a word, farming has taken on new life and energy, and other counties are clamoring for help.

We now have the following named gentlemen acting in the capacity of representatives of the Department of Agriculture and Teachers of agriculture in the high schools:

County	Name	Location
Algoma	Smith, A. S.	Sault Ste. Marie
Carleton	Jackson, W. D.	Carp
Dufferin	Dorrance, H. A.	Orangeville
Dundas	Campbell, A. D.	Morrisburg
Elgin	Clement, F. M.	Dutton
Essex	Edwards, W. E. J.	Essex
Grey	Duff, H. C.	Markdale
Hastings	McIntosh, A. D.	Stirling
Lambton	Todd, S. E.	Petrolea
Lanark	Hamer, R. S.	Perth
Norfolk	Smith, J. E.	Simcoe
Northumberland and Durham	Duncan, R. S.	Port Hope
Ontario	Hare, J. H.	Whitby
Peterborough	Hopkins, E. S.	Norwood
Prince Edward	McVannel, A. P.	Picton
Simcoe	Laughland, J.	Collingwood
Thunder Bay	Collins, G. W.	Fort William
Victoria	McKenzie, D. A.	Lindsay
Waterloo	Hart, F. C.	Galt
York	Steckley, J. C.	Newmarket

Teachers' Courses.

The work at this College among rural school teachers has certainly had beneficial results. The scores of letters which come to us indicate that the inspiration and information received here has proven to be a very boon to the teachers on their return to the country schools. Two courses are now well planned and well carried out under the direction of our Professor of Nature Study. In the first place, the teachers come to us at the close of the second term in the Normal Schools at Easter, and remain until mid-summer, ten weeks in all. The second course is for teachers of experience, who can get away from their schools at one time of the year only—namely, the summer vacation. This course is growing in popular favor, and during the present summer 196 teachers attended the Courses in Agriculture, Horticulture, Industrial Arts, and Domestic Science. This work cannot help but influence the rural teaching in this Province, and when followed up by correspondence, leaflets, pamphlets, books, and magazines, all bearing on the subject, it must accomplish a good deal in the way of stimulating and instructing the minds of the children in country places.

Changes in Staff.

Many changes have taken place in the staff again this year. Prof. S. B. McCready has resigned his position as Professor of Botany at the College, but retains the title of Professor of Nature Study. In the meantime he has assumed the duties of Inspector of School Gardens for the Department of Education. He will live in Guelph, have his office at the College, and direct the work of our Special Courses for Teachers.

Mr. J. E. Howitt has been appointed Professor of Botany in place of Prof. McCready, resigned.

Mr. J. W. Eastham, Lecturer in Botany, resigned in the month of June to take a position at the Central Experimental Farm, Ottawa. This position has been filled by the appointment of W. A. McCubbin, B.A., a graduate of Toronto University and a Post-Graduate of Harvard University.

In the Department of Physics, Mr. W. R. Reek resigned the position of Dem-

onstrator to take work in the office of the Deputy-Minister of Agriculture, Toronto. He was succeeded by Mr. J. Spry, B.S.A., a graduate of 1911.

In the Poultry Department Mr. M. C. Herner, B.S.A., occupied the position of Demonstrator for a few months, until he was selected by the Board of Governors of the Manitoba Agricultural College, at a much higher salary, to take charge of the Department of Poultry in that Institution. Mr. H. B. Webster, B.S.A., has been appointed Demonstrator in his place.

In the Department of English we have at last got a permanent Lecturer, in the person of Mr. G. H. Unwin, B.S.A.

Mr. Unwin's resignation necessitated the appointment of a new Resident Master, and Mr. S. H. Hopkins, who had finished his second year at this College, was appointed to the position.

In the Department of Chemistry, Mr. L. D. Jackson, who has been doing most excellent work, resigns at the end of the year to take a responsible position in a large Milling Company in the city of Winnipeg. Mr. A. J. Galbraith, B.S.A., one of our own graduates and a Specialist in Chemistry, who during the fall term has been profiting by a scholarship at Toronto University, will be appointed Demonstrator in Chemistry to succeed Mr. Jackson, his duties beginning Jan. 1.

Mr. J. B. Fairbairn, who has been my Secretary for a number of years, resigned his position this year to go farming in the Niagara district. His position has been filled by the appointment of Mr. S. H. Gandier, B.S.A., of the class of 1911.

At the Macdonald Institute two most excellent women have resigned from the staff. Miss Evelyn Allan, who has had charge of the laundry work for four years, resigns her position at the end of this year. She will be succeeded in her work by Miss M. G. Walsh.

Miss Tennant, who has been housekeeper since the organization of Macdonald Hall, has accepted a more remunerative position in the new Agricultural College of Saskatchewan. Her work will be carried on by Miss Margaret Smellie.

We regret the removal of all of these persons from our staff, but at the same time we must congratulate them on their intelligence, their energy, and their perseverance, for they have, one and all, by sheer ability attracted the attention of educationists all over the country. I am also pleased that we have been able to find such excellent men and women to succeed to these vacant positions.

College Work and Progress.

We have had practically no increase in buildings, class-rooms, or laboratories for several years, and we are beginning now, with the constantly increasing student body, to find ourselves a little crowded for room. This applies to the class-rooms and laboratories, as well as to the dormitory. We are trusting that this year the Government will be able to spare money for this work, and plans are being prepared for a new dining-room to accommodate five hundred students.

The drainage survey work, in connection with the Department of Physics, has again shown an increase this year. Already 44,140 acres have been surveyed by our college boys during the past six years. A full account of this work will be found in its proper place in this report. The demand for help increases every year, but we believe it is good work to help all the applicants who may apply.

The bulletins prepared during the year by members of the staff and published by the Department of Agriculture are as follows:

187. "The Codling Moth," by L. Caesar.
188. "Weeds of Ontario," by J. E. Howitt.
189. "Farm Poultry," by W. R. Graham.
193. "Tuberculosis of Fowls," by S. F. Edwards.

Short Courses.

These continue popular from year to year, and I am pleased to say that many a boy coming to such a course for the first time gets an idea of what the college may do for him and later on comes back for one or two years' regular work. The attendance at these courses for 1911 was as follows: Dairy Course, 37; Teachers' Courses (Agriculture, Horticulture, and Industrial Arts) 99; Short Course in Stock and Seed Judging, 182; Short Course in Poultry Raising, 32; Short Course in Horticulture, 162; One-Month Course in Domestic Science, 26; One-Month Course in Elementary Agriculture and Horticulture, 19; One-Month Course in Nature Study, 83; One-Month Course in Woodwork and Mechanical Drawing, 28; and One-Month Course in Art and Constructive Work, 40.

Stock Judging.

We were some months deciding whether we would again go into the Stock Judging Competition at Chicago. Students were anxious to attend the show, and it was finally decided that we would send a team as usual. It is our custom not to pick the team until just before they go to Chicago, and the same rule was followed this year. By such a process interest is kept up in the entire class, and from thirty to forty good judges are trained, although only five men compete. Competition in Chicago is only a means to an end, not the object of the training by any means. One wants all the men in the Fourth Year Agricultural Option to be good judges of live stock, and if they can win at Chicago as well, we are always pleased. We selected our men, as usual, entirely from the Fourth Year, and the following composed the team: T. O. Clark, Irma, Alberta; A. McMillan, Dutton, Ont.; L. Stevenson, Ancaster, Ont.; A. A. Toole, Mount Albert, Ont.; and E. A. Weir, Randwick, Ont.

This year our men stood fourth, but the first and second places went to other Canadian teams; so that the Dominion of Canada carried away nearly all of the honors, notwithstanding the fact that our boys were not familiar with a number of the breeds of live stock entered in the competition.

Experimental Union.

The Union meeting was held this year during the time of the Short Course in Stock and Seed Judging in the month of January. A good attendance was assured, but we were disappointed in the number of ex-students who came back. This may be accounted for in two ways: first, that a large number of them got into the habit of coming to the Winter Fair, just the month previous, and could not find the time to pay a second visit to Guelph when the dates came so close together: and in the second place, college men get the substance of the work of the Union largely through reports and are able to put it to use without any explanation whatever. As the Union, however, is largely an ex-student affair, we shall probably go back to the old dates, unless there is a larger attendance at the next meeting, which is to be held in January, 1912.

I do not suppose there is a more important organization to be found anywhere than the Ontario Agricultural and Experimental Union. Over 5,000 farmers on their own farms are conducting experiments through the College every year. They are being supplied with pure seed, with directions for the preparation of the grain, the planting, care of crop, and the harvesting of it. They are assured increas-

ed prices for better seed, and they are responding splendidly to the invitation. I do not know how we could have got our Experimental Farm results directly into the hands and minds of the farmers without this Union; and it, together with the Agricultural Representatives in the several counties, will, without doubt, have a marked effect upon the life and work of the people in our farming communities.

STUDENTS OF THE YEAR.

Attendance.

General Course	458
Specialists in General Course Work	23
Manual Training (One Year Normal Course)	15
Teachers' Courses (Agriculture and Horticulture, 76; Industrial Arts, 23)	99
Dairy Courses	37
Stock and Seed Judging	182
Poultry Raising	32
Fruit Growing	162
	1,008

At Macdonald Institute.

Domestic Science	353
Nature Study (83), Elementary Agriculture and Horticulture (19), Woodwork and Mechanical Drawing (28), Art and Constructive Work (40), Domestic Science (26), (Summer School)	196
	549
Total	1,557

There were also 120 children from the Guelph Public Schools who received instruction in Domestic Science at Macdonald Institute.

Analysis of College Roll (General Course), 1911.

From Ontario.

Algoma	4	Huron	7	Perth	7
Brant	12	Kent	9	Peterboro	1
Bruce	5	Lambton	14	Prescott	1
Carleton	14	Lanark	1	Prince Edward	1
Dufferin	4	Leeds	3	Rainy River	1
Dundas	3	Lennox	1	Renfrew	3
Durham	4	Lincoln	15	Russell	5
Elgin	6	Middlesex	13	Simcoe	8
Essex	5	Muskoka	2	Thunder Bay	1
Frontenac	3	Nipissing	1	Victoria	3
Glengarry	3	Norfolk	7	Waterloo	9
Grenville	3	Northumberland	9	Welland	8
Grey	7	Ontario	9	Wellington	38
Haldimand	4	Oxford	7	Wentworth	16
Halton	2	Parry Sound	3	York	43
Hastings	1	Peel	6		
				Total from Ontario.	332

From Other Provinces of the Dominion.

Alberta	14	New Brunswick	1	Saskatchewan	6
British Columbia	31	Nova Scotia	3		
Manitoba	1	Quebec	2	Total from other Provinces	58

From Other Countries.

Argentine Republic	1	India	1	Scotland	4
Brazil	1	Jamaica	2	South Africa	11
B. W. I.	3	Japan	2	Spain	2
Denmark	1	Java	1	U. S. A.	12
East Indies	1	Natal	1		
England	21	Newfoundland	2	Total from other Countries	68
Ireland	1	New Zealand	1		

Ages and Religious Denominations.

The limits of age in the General Course, 1911, ranged from 16 to 43 years. The average age was 21.

Anglican	2	Episcopalians	111	Methodists	131
Baptists	35	Evang. Association	4	No religion	3
Christadelphians	4	Friends	4	Presbyterian	125
Christian Assoc.	1	Jewish	1	Roman Catholic	19
Congregational	5	Latter Day Saints	2	United Brethren	1
Disciples	4	Lutheran	1	Quaker	1
Dutch Reform	3	Mennonite	1		

Bachelors of the Science of Agriculture, 1911.

Austin, R., Tottenham, Ont.
Baker, A. C., London, Ont.
Baker, A. W., London, Ont.
Baldwin, M. M., Colchester, Ont.
Buchanan, C. W., Florence, Ont.
Clement, F. M., Virgil, Ont.
Coglan, R. B., Coutts, Alta.
Dempsey, P. C., Trenton, Ont.
Dorrance, H. A., Seaforth, Ont.
Fisher, P. A., Burlington, Ont.
French, P. E., Vernon, B.C.
Galbraith, A. J., Hornby, Ont.
Galbraith, C. A., Hornby, Ont.
Gandier, S. H., Lion's Head, Ont.
Gordon, D., Elora, Ont.
Henderson, I. B., Hampden, Ont.
Herner, M. C., Berlin, Ont.
Heurtley, E. W., Wilmer, B.C.
Hopkins, E. S., Lindsay, Ont.
Howes, E. A., Guelph, Ont.
Hutchinson, A., Mount Forest, Ont.
King, V., Gravesend, England.
Landels, B. H., River Hebert, N.S.
Light, P., Hensall, Ont.
Longley, W. V., Paradise, N.S.
MacKay, N. C., Scotsburn, N.S.
Main, C., Sheffield, Ont.
Marcellus, F. N., North Winchester, Ont.
McAleer, H. A., Philadelphia, U.S.A.
Packard, R. C., Brockton, Mass.
Peart, G. S., Freeman, Ont.
Porter, W. H., Kingsman's Corners, N.S.
Revell, H. K., Walkerville, Ont.
Robertson, W. H., Barrington Passage, N.S.
Ross, W. A., Edinburgh, Scotland.
Rutherford, R. L., River Hebert, N.S.
Scott, W. R. M., Toronto, Ont.
Shortill, R. J., Ballinafad, Ont.
Smith, J. E., Shallow Lake, Ont.
Spry, J., Easton's Corners, Ont.
Steckley, J. C., Bethesda, Ont.
Taggart, J. G., Lower Onslow, N.S.
Thomson, R. G., Boharm, Sask.
Toole, W., Whitevale, Ont.
Wearne, H., Rischeim, Alsace, Germany.
Webster, H. B., Science Hill, Ont.
Whale, I. B., Goldstone, Ont.

Recipients of Associate Diplomas, 1911.

Ackers, C. J., Brantford, Ont.
Beckett, R. S., South Pelham, Ont.
Bramhill, G. G., Harriston, Ont.
Britton, J. E., Toronto, Ont.
Buchanan, J. H., Florence, Ont.
Calvert, E. W., Reaboro, Ont.
Campbell, A. M., Berea, Natal.
Carroll, J. A., Cowal, Ont.
Cleeves, A. C., Hagans, B.C.
Coleman, H. W., Inkerman, Ont.
Culham, G. J., Toronto, Ont.
Darling, E. H., Lambton Mills, Ont.
Davies, E., Brantford, Ont.
Finnie, W. E. B., St. Mary's, Ont.
Fry, H. S., Vineland, Ont.
Grange, J. B., Toronto, Ont.
Hampson, E., Mount Forest, Ont.
Harding, P. S. D., Lacombe, Alta.
Hart, M. M., St. Lambert, Que.
Hayes, W. H., St. John, N.B.
Heggie, G. O., Somenos, B.C.
Henry, L. B., Winona, Ont.
Hextall, L. J., Calgary, Ont.
Hiddleston, J. S., O.A.C., Guelph.
Hood, E. G., Hagerman, Ont.
Hopkins, S. H., O.A.C., Guelph.
Howitt, E. H., Guelph, Ont.
Howitt, M. H., Hamilton, Ont.
Howlett, W., Winterbourne, Ont.
Hunter, W. T., Welland, Ont.
Jarvis, G. L., Grimsby, Ont.
Jeffrey, W. N., Stratford, Ont.
Jenkins, G. J., Todmorden, Ont.
Johnston, S. C., Grafton, Ont.
Kay, H. R., Merrickville, Ont.
King, W. H. M., Hickson, Ont.
Millen, F. E., O.A.C., Guelph.
Miller, J., Mount Elgin, Ont.
Moore, J. A. C., Islington, Ont.
Murray, H. G., Toronto, Ont.
Nixon, H. C., St. George, Ont.
Noble, J. W., Hornings Mills, Ont.
Pawley, N. H., Mayfield, Ont.
Presant, H. E., Guelph, Ont.
Reid, H., Kensington, England.
Sackville, J. P., Bewdley, Ont.
Stairs, K., Huntsville, Ont.
Staniforth, H., Aldersyde, Alta.
Stanley, C. W., Granton, Ont.
Stark, J. W., Chatham, Ont.
Tisdale, W. H., Paris, Ont.
Tomlinson, A. H., Devonport, England.
Tregillus, C. A., Calgary, Alta.
Vining, R. L., Thorndale, Ont.
Wallace, G. M., Kars, Ont.
Wilson, Geo., Oakville, Ont.
Woltz, G. L., Brantford, Ont.

First Class Men.

The work of the College is divided into Departments, and all candidates who obtain an aggregate of seventy-five per cent. of the marks allotted to the subjects in any Department are ranked as first class men in that Department. The following list contains the names of those who gained a first class rank in the different Departments, examinations held in April, 1911, arranged alphabetically.

First Year.

Bergey, J. E., in one department, Biology.
Carpenter, G. S. L., in one department, Biology.
Crawford, J. D., in one department, Biology.
Crawford, S. L., in one department, Biology.
Culverhouse, P. E., in three departments, English and Mathematics, Chemistry and Physics, Biology.
Davis, L. M., in three departments, English and Mathematics, Chemistry and Physics, Biology.
Freeborne, S. G., in four departments, English and Mathematics, Chemistry and Physics, Biology, Agriculture.
Gardiner, L. J. W., in one department, Biology.
Good, C. A., in one department, English and Mathematics.
Hare, H. R., in one department, English and Mathematics.
Hipple, L. E., in three departments, English and Mathematics, Chemistry and Physics, Biology.
Hirst, G. S., in three departments, English and Mathematics, Chemistry and Physics, Biology.
Kelleher, M., in two departments, Chemistry and Physics, Biology.
Laidlaw, C. M., in one department, Chemistry and Physics.
Lattimer, E., in one department, Biology.
Leppan, H. D., in two departments, Chemistry and Physics, Biology.
Nash, J. F., in four departments, English and Mathematics, Chemistry and Physics, Biology, Agriculture.
Neelands, C. F., in two departments, English and Mathematics, Chemistry and Physics.
Puleston, E. A., in one department, English and Mathematics.
Robb, O., in two departments, Chemistry and Physics, Biology.
Scott, H. M., in one department, English and Mathematics.
Strong, W. F., in one department, Biology.
Waterhouse, F., in two departments, Chemistry and Physics, Biology.
Winslow, J. H., in four departments, English and Mathematics, Chemistry and Physics, Biology, Agriculture.

Second Year.

Davies, E., in one department, English.
Harding, P. S. D., in one department, Biology.
Henry, L. B., in one department, Biology.
Hextall, L. J., in three departments, English, Chemistry and Physics, Biology.
Hopkins, S. H., in four departments, English, Chemistry and Physics, Biology, Agriculture.
Kay, H. R., in one department, English.
King, H. M., in one department, Agriculture.
Miller, J., in one department, English.
Stanley, C. W., in three departments, Chemistry and Physics, Biology, Agriculture.
Stark, J. W., in three departments, English, Biology, Agriculture.

Scholarships.

Scholarships of $20 in money were awarded for groups of subjects in first year work as follows: Highest standing with a minimum of forty per cent. of the marks of each subject, and an aggregate of seventy-five per cent. of the total number of marks allotted to the subject in the group:

Agriculture, S. G. Freeborne, Magnetawan, Ont.
Biological Science, J. F. Nash, Windsor, Ont.
English and Mathematics, J. H. Winslow, Chelsea Green, Ont.
Physical Science, F. Waterhouse, Killiney, Ireland.

PROFESSIONAL DAIRY SCHOOL CERTIFICATES ISSUED DURING 1911.

Coleman, H. W., O. A. C., Guelph ..... Cheese
Carr, H. N., Port Elgin, Ont. ..... Butter
Grieve, T. W., Moorefield, Ont. ..... Cheese
Hefler, F. L., Dairy Department, O. A. C. ..... Butter
Lowe, H. B., City Dairy Co., Toronto ..... Butter
Marshall, L., Port Dover, Ont. ..... Butter and Cheese
McEwan, J. G. A., Lucknow, Ont. ..... Cheese
Neville, N., Lambeth, Ont. ..... Cheese
O'Hara, A. J., Lorenz, Ont. ..... Cheese
Rickwood, G., Dairy Dept., O. A. C. ..... Butter
Clubb, J. R. Brigden, Ont. ..... Butter
Eastman, F. C., Arkona, Ont. ..... Cheese
Patrick, H. W., Elgin, Ont. ..... Butter
Gray, P. J., Linden Valley, Ont. ..... Cheese

MACDONALD INSTITUTE.

SUMMARY OF ATTENDANCE IN 1911.

A.—January to June, completing the College year of 1910-1911.

1. Normal Students:	
(*a*) Juniors of Two-year course	15
(*b*) Seniors of Two-year course	14
(*c*) Seniors of One-year course	8
2. Housekeepers—Two-year course:	
(*a*) Juniors	13
(*b*) Seniors	9
3. Homemakers—One-year course	42
4. Short Course in Domestic Science—Three months:	
(*a*) Winter term students	33
(*b*) Spring term students	23
5. Short Course in Sewing—Three months:	
(*a*) Spring term students	6
6. Optional students	23
7. Student-workers	3
8. Public School students	59

B.—Summer Course in Domestic Science 26

C.—September to December, opening the College year of 1911-1912.

1. Normal Students:	
(*a*) Juniors of Two-year course	14
(*b*) Seniors of Two-year course	14
(*c*) Seniors of One-year course	9
2. Housekeepers—Two-year course:	
(*a*) Juniors	13
(*b*) Seniors	9
3. Homemakers—One-year course	24
4. Short Course in Domestic Science—Three months	37
5. Short Course in Sewing—Three months	11
6. Optional	4
7. Student-workers	3
8. Public School Students	61
Total	473

D.—Students counted in both above lists:

1. In Two-year courses	22
2. In Public School Classes	5
	27

E.—Total number of students in 1910 408

F.—Total number of students in 1911 446

GRADUATES OF MACDONALD INSTITUTE, 1911.

Two-year Normal Course in Domestic Science:

Miss Anna Louise Bickford, Dundas, Ont.
Miss Norah Laurence Burke, 156 Park Rd., Toronto, Ont.
Miss Agnes Macdonald Carpenter, Fruitland, Ont.
Miss M. Edith Cooke, Orillia, Ont.
Miss Marjorie Cameron Cooke, Orillia, Ont.
Miss Kate Alfreda Hales, College Heights, Guelph, Ont.
Miss Ruth Lampkin, Moscow, Ont.
Miss Roberta McAdams, 233 Brock St., Sarnia, Ont.
Miss Marian Mactavish, Parkhill, Ont.
Miss Joan Powell, 205 Perth St., Guelph, Ont.
Miss Jessie L. Ross, Lindsay, Ont.
Miss Beatrice Seaborn, 500 Quebec St., London, Ont.
Miss Hazel Staebler, 24 Ellen St., Berlin, Ont.
Miss Davina M. Sutherland, Embro, Ont.

One-year Normal Course in Domestic Science:

Miss Grace Boggs, Cobourg, Ont.
Mrs. Carrie Holmes Burns, 117 Bernard Ave., Toronto, Ont.
Miss Louise Perkins, Norton, King's Co., N.B.
Miss M. Georgia Walsh, Springville, Ont.
Miss Evelyn P. Wright, Port Colborne, Ont.

Housekeeper Course:

Miss Margaret L. Carrick, Roseville, Ont.
Miss Kate Comfort, Welland, Ont.
Miss Margaret Dunlop, 175 Charlton Ave. E., Hamilton, Ont.
Miss Jessie Elliot, Woodbridge, Ont.
Miss Annie J. Gardiner, 111 Russell Ave., St. Catharines, Ont.
Miss Winkona W. Frank, Orangeville, Ont.
Miss Lottie E. Howell, c.o. Dr. Secord, Brantford, Ont.
Miss Lucy McLellan, Florence, Ont.

Homemaker Course:

Miss Amy I. Baines, 426 Huron St., Toronto, Ont.
Miss Alice Barron, 118 Norman St., Stratford, Ont.
Miss Edith Beard, 160 George Rd., Victoria, B. C.
Miss Annie Bell, Tavistock, Ont.
Miss Beatrice Brown, 174 George St., Hamilton, Ont.
Miss Olive Buchan, Bank of Hamilton, Vancouver, B.C.
Miss Nettie Carrick, Roseville, Ont.
Miss Florence Cober, Galt, Ont.
Miss Edith Crawford, Dobbinton, Ont.
Miss Eleanor Dickie, Hespeler, Ont.
Miss Helen Douglas, 13 Bold St., Hamilton, Ont.
Miss Frances Dutton, 533 Aylmer St., Peterboro, Ont.
Miss Enid Farmer, 750 Bathurst St., Toronto, Ont.
Miss Annie Greenfield, Morley, Ont.
Miss Mary Gregory, Port Dalhousie, Ont.
Miss Anna Greig, 116 Norquay St., Winnipeg, Man.
Miss Jean Greig, 116 Norquay St., Winnipeg, Man.
Miss Lena Herrington, Napanee, Ont.
Miss Audrey Lightbourn, Oakville, Ont.
Miss Helena Mallory, 194 Victoria Ave., Belleville, Ont.
Miss Gertrude McGiffin, 412 Somerset St., Ottawa, Ont.
Miss Evelyn McKay, Rose St., Galt, Ont.
Miss Vera Martin, 254 Aberdeen Ave., Hamilton, Ont.
Miss Freda Proctor, 365 Russel St., Sarnia, Ont.
Miss Helen Richardson, St. Marys, Ont.
Miss Dorothy Rutherford, 120 Lewis St., Ottawa, Ont.
Miss Olive Scott, McGregor, Ont.
Miss Hilda Smith, Cornwall, Ont.
Miss Beatrice Snelling, Rockliffe Park, Ottawa, Ont.
Miss Dorothy Walker, 12 Edgar Ave., N. Rosedale, Toronto.
Miss Gwendolyn Ware, Haileybury, Ont.
Miss Pearl Whittaker, College Ave., Guelph, Ont.
Miss Blanche Young, Cornwall, Ont.

The following are entitled to the Professional Housekeeper certificate as having accomplished six months' institution housekeeping:

Miss Sibylla Hadwen. Miss Annie A. Pettingell. Mrs. Agnes C. Simmons.

MEDALS, SCHOLARSHIPS AND PRIZES AWARDED APRIL, 1911.

The George Chapman Scholarship.

A prize of $20 in books awarded on the work in English of the first two years. The three divisions of the work under the English Department are taken into consideration in awarding the prize, namely, English Literature, English Composition and Public Speaking. Winner in 1911: J. Miller, Mt. Elgin, Ont.

Prizes.

Three prizes of the value of $10 each in books were awarded as follows:

One to the second year student who composed and read before a committee the best essay on the subject assigned for the year, viz., "The Ontario Pioneer in Agriculture," G. J. Jenkins, Todmorden, Ont.

One to the student who stood first in general proficiency on first and second year work—Theory and Practice—S. H. Hopkins, Lower Nicola, B.C.

One to the student who ranked highest in general proficiency and obtained first-class honors in his major subjects in the fourth year. Winner: A. J. Galbraith, Hornby, Ont.

Special Prizes.

Second Year prize in English: J. Miller, Mount Elgin, Ont.
Third Year prize in English: H. S. Ryrie, Oakville, Ont.

Medals.

Governor-General's Silver medal: First in General Proficiency, first and second year work, 1910-1911. Winner: S. H. Hopkins, Lower Nicola, B.C.

Barton-Hamer Gold Medal: Awarded to that member of the O.A.C. International Live Stock Judging Team securing the highest number of marks in the Students' Judging Contest, held annually at Chicago. Winner, December, 1911, E. A. Weir, Randwick, Ont.

RESULTS OF JUDGING COMPETITION.

Winter Fair, 1911.

Horses.	*Beef Cattle.*	*Dairy Cattle.*
1. Shaver, F. D.	1. Phillips, H. L.	1. Iwanami, J.
2. Tipper, R. M.	2. Nixon, W. G.	2. Barnet, I. T.
3. Graham, C. M.	3. Tipper, R. M.	3. Hinman, W. C.
4. Ross, W. M.	4. Bosman, A. M.	4. Davison, W.
5. McCulloch, A. C.	5. Sirett, A. W.	5. Schuyler, R.
6. Phillips, H. L.	6. Schuyler, R.	6. Tregillus, C. A.
7. Dougall, R.	7. Craig, J. A.	7. Laidlaw, C. M.
8. (Outsider.)	8. Allan, J. N.	8. Neff, E. F.
9. Duff, G. C.	9. Steckle, H. S.	9. Sorley, J. N.
10. Hotson, J. N.	10. Ellis, G. C.	10. Hinman, R. B.

Sheep.

1. Stanley, C. W.
2. Bosman, A. M.
3. Batty, E. C.
4. Castro-Zinny, H.
5. Madden, G. O.
6. Hinman, R. B.
7. Barnet, I. T.
8. Walker, F. T.
9. (Outsider.)
10. Beckett, R. S.

Swine.

1. (Outsider.)
2. Vining, R. L.
3. Ellis, G. C.
4. Millen, F. E.
5. McRostie, J. E.
6. Cormie, G. M.
7. Aikenhead, W. M.
8. Kyono, J.
9. Kelleher, M.
10. Lindsay, E.

I have the honor to be,

Your obedient servant,

G. C. CREELMAN.

GUELPH, December 23, 1911.

FINANCIAL STATEMENT.

(November 1st, 1910, to October 31st, 1911.)

COLLEGE DEPARTMENT.

EXPENDITURE.

Salaries and wages	$71,316 00
Servants' pay list	3,983 80
Meat, bread, groceries, laundry, engine room supplies and fuel	33,351 61
Advertising, printing, postage and stationery	3,876 73
Maintenance, 5 laboratories and gymnasium	7,502 53
Expenses, short courses	1,315 58
Temporary assistance	749 84
Student labor	4,320 28
Travelling expenses and extra lectures	1,798 73
Library	1,748 46
Scholarships	120 00
Telephone service, rents, etc.	421 50
Furnishings and repairs	3,943 84
Sewage	540 00
Contingencies	1,319 94
Total Expenditure	$136,308 84
Less Revenue	41,423 12
Net Expenditure	$94,885 72

REVENUE.

Board	$23,723 25
Tuition and laboratory fees	15,916 50
Supplemental examinations	132 00
Chemical analyses	522 35
Rent of post office boxes	40 25
Rent of rooms	133 50
Rent of cottages	260 00
Fines and breakages	498 55
Sundries	196 72
Total Revenue	$41,423 12

MACDONALD INSTITUTE AND HALL.

Expenditure.

Salaries and wages	$17,670 00
Servants' pay list	2,147 56
Meat, bread, groceries, furnishings, repairs, engine room supplies, fuel and labor on grounds	14,087 39
Maintenance of laboratories in institute	2,878 60
Library and stationery	433 84
Total Expenditure	$37,217 39
Less Revenue	22,828 81
Net Expenditure	$14,388 58

Revenue.

Board	$14,593 70
Tuition and laboratory fees	8,077 25
Supplemental examinations	4 00
Fines, breakages and food purchases by students	89 96
Sundries	63 90
Total Revenue	$22,828 81

FARM DEPARTMENT.

Expenditure.

Permanent improvements	$ 481 27
Wages of men, foreman and stenographer	7,284 12
Purchase of live stock	2,994 69
Maintenance of stock	3,787 56
Farm maintenance, including repairs, blacksmithing, binder twine, seed furnishings, fuel, light, advertising, printing, stationery, tools, implements, etc.	2,282 87
Contingencies	349 19
Total Expenditure	$17,179 70
Less Revenue	6,271 33
Net Expenditure	$10,908 37

Revenue.

Sale of cattle:—		
15 Calves at from $2.00 to $40.00	$230 00	
2 Steers at $35.00 and $40.00	75 00	
3 Cows at from $45.00 to $50.00	140 00	
2 Bulls at $50.00 and $75.00	125 00	
9 Cattle, 10,760 lbs. at $5.75 cwt.	618 70	
1 Carcass, 500 lbs. at 9½c.	47 50	
		$1,236 20
Sale of pigs:—		
23 Sows at from $12.00 to $30.00	$532 00	
1 Sow, 675 lbs. at $4.25	28 69	
6 Boars at from $10.00 to $15.00	65 00	
1 Crippled pig for	5 00	
43 Hogs, 8,085 lbs. at from $6.50 to $9.00 cwt.	595 21	
		1,225 90
Sale of Sheep:—		
4 Rams at from $12.00 to $20.00	$67 00	
44 Lambs at from $4.75 to $10.00	259 50	
3 Wethers at from $12.50 to $14.00	39 00	
10 Ewes at from $6.50 to $8.00	70 00	
		435 50
Sale of Milk:—		
15,450 quarts at 4c.	$618 00	
84,814 lbs. at $1.60 cwt.	1,357 02	
1,695.40 lbs. fat at from 22 to 30.9 cts.	438 16	
		2,413 18

Service of animals	192 00
Sale of 4 Horses at from $75.00 to $225.00	655 00
" 1 old hay loader for	20 00
" 1 old hay rake for	20 00
" 495 lbs. wool at from 13c. to 15c.	69 71
" 1 Beef hide, 48 lbs. at 8c.	3 84
Total Revenue	$6,271 33

EXPERIMENTAL DEPARTMENT.

EXPENDITURE.

Permanent improvements	$ 504 00
Assistant, specialist in plant breeding, stenographer, foreman, teamsters and laborers	10,280 26
Seeds, manure and special fertilizers	664 84
Furnishings, implements, repairs, blacksmithing, etc.	899 90
Printing, postage, stationery and contingencies	306 83
Purchase of horse and feed of horses	541 10
Total Expenditure	$13,196 93

DAIRY DEPARTMENT.

EXPENDITURE.

Wages, including foreman, cheesemaker, buttermaker, engineer, stenographer and bookkeeper, assistant and official tester of dairy cattle	$3,150 50
Purchasing, hauling and manufacturing milk into butter and cheese	3,743 59
Furniture, furnishings, repairs, etc., laboratory expenses, gas, chemicals, etc., and contingencies	996 38
Fuel and light	290 51
Total Expenditure	$8,180 98
Less Revenue	5,594 91
Net Expenditure	$2,586 07

REVENUE.

Sale of Cheese, 21,687 11-16 lbs. at from 7c. to 60c.		$2,478 77
" Butter, 151 lbs. at from 15c. to 26c.		28 92
" Cream, 1,591 quarts at 20c.	$318 20	
15 Jars Devonshire Cream at 15c.	2 25	
		320 45
" Fat, 1988.38 lbs. at from 24c. to 30.9c.		553 17
" Skimmilk, 80,472 lbs. at 20c. cwt.		160 94
" Buttermilk, 89,045 lbs. at from 10c. to 40c. cwt.	$171 93	
34 Buttermilk tickets at 25c.	8 50	
		180 43
Manufacturing 36709.04 lbs. butter at from 3½c. to 5c.		1,632 48
Sundries		69 75
Rent of houses		170 00
Total Revenue		$5,594 91

DAIRY SCHOOL.

EXPENDITURE.

Wages of instructors, engineer, janitor, stenographer and bookkeeper	$2,275 00
Cleaning, painting, repairs and contingencies	103 12
Dairy appliances, separators, vats, expenses cheese and butter judges, inspecting factories, etc.	465 84
Advertising, printing, stationery, postage, books, papers, etc.	149 08

Fuel and light	597 30
Purchase of milk for cheesemaking and cost of hauling milk and cream	3,356 09
Total Expenditure	$6,946 43
Less Revenue	2,517 78
Net Expenditure	$4,428 65

REVENUE.

Sale of Butter, 28 lbs. at 28c.	$ 7 84
" Cheese, 14,433½ lbs. cheese at from 4c. to 60c.	1,669 06
" Cream, 652 quarts at 20c.	130 40
" Fat, 1861.08 lbs. at from 29.7c. to 30c.	556 27
" Buttermilk, 36,830 lbs. at 20c. cwt.	73 66
Fees	61 00
Sundries	19 55
Total Revenue	$2,517 78

POULTRY DEPARTMENT.

EXPENDITURE.

Wages of assistant, stenographer and temporary assistance	$1,325 80
Furnishings and repairs	994 70
Permanent improvements	98 68
Purchase of stock	175 61
Fuel, light and contingencies	325 76
Experiments with incubator, fattening and feed	2,988 90
Feed of horse	50 00
Total Expenditure	$5,959 45
Less Revenue	4,799 76
Net Expenditure	$1,159 69

REVENUE.

Sale of live poultry:—		
539 live birds for		$ 795 50
Sale of dressed poultry:—		
7,911-5/8 lbs. at from 10c. to 50c.	$1,398 75	
14 prs. broilers at from 75c. to $1.50	16 00	
		1,414 75
Sale of eggs for hatching:—		
434 settings for	$518 00	
15,146 eggs at from 3c. to 20c. each	748 65	
		1,266 65
Sale of eggs for domestic use:—		
4,917 1-4 doz. at from 10c. to 50c.		1,316 71
Sundries		6 15
Total Revenue		$4,799 76

HORTICULTURAL DEPARTMENT.

EXPENDITURE.

Permanent improvements	$499 67
Head gardener and foreman, assistant in plant breeding, assistant and night fireman, teamsters, assistant gardener, stenographer and laborers	6,493 27
Manure, trees, plants, bulbs, seeds, cold storage experiments, implements, tools, furnishings, repairs and contingencies	1,699 80
Fuel and light	751 72

Wax fruit models	28 00
Feed of horses	200 00
Total Expenditure	$9,672 46
Less Revenue	969 47
Net Expenditure	$8,702 99

REVENUE.

Sale of fruit and vegetables	$969 47

MECHANICAL DEPARTMENT.

EXPENDITURE.

Salary of foreman	$900 00
Tools, furnishings and repairs	223 43
Total Expenditure	$1,123 43

APICULTURE DEPARTMENT.

EXPENDITURE.

Equipment and maintenance	$748 20
Less Revenue	30 04
Net Expenditure	$718 16

REVENUE.

Sale of honey, 296 3-4 at from 10c. to 12½c.	$30 04

SOIL PHYSICS DEPARTMENT.

EXPENDITURE.

Services and expenses of temporary assistants in connection with Farm Drainage Demonstrations	$3,999 31

FORESTRY DEPARTMENT.

EXPENDITURE.

Contingencies	$1,475 98

SUMMARY, 1911.

	Expenditure.	Revenue.	Net Expenditure.
College	$136,308 84	$41,423 12	$94,885 72
Macdonald Institute and Hall	37,217 39	22,828 81	14,388 58
Farm	17,179 70	6,271 33	10,908 37
Experimental	13,196 93	.....	13,196 93
Dairy	8,180 98	5,594 91	2,586 07
Dairy School	6,946 43	2,517 78	4,428 65
Poultry	5,959 45	4,799 76	1,159 69
Horticultural	9,672 46	969 47	8,702 99
Mechanical	1,123 43	.....	1,123 43
Apiculture	748 20	30 04	718 16
Soil Physics	3,999 31	.....	3,999 31
Forestry	1,475 98	.....	1,475 98
	$242,009 10	$84,435 22	$157,573 88

S. SPRINGER,
Bursar and Superintendent.

PART II.

THE PROFESSOR OF ENGLISH.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to present herewith my seventeenth annual report for the department of English.

In my report for 1910 I outlined briefly the course in English as it has been shaped in accordance with the requirements of a technical training in Agriculture. A comparison of the course as it was when the first report from this department was presented, with the present course, shows important changes, and, I beg leave to say, important advances. Seventeen years ago the only work in composition, or the writing of themes, required of any class was the second year thesis, one rather lengthy essay on a practical subject. At the present time, the first year write during the year eight or ten short compositions on subjects of their own choosing, and these are all carefully read and valued by an instructor. The second year write four or five essays in the autumn term, and usually two in the winter term. These papers are valued for their literary qualities, and the ordinary principles of composition, such as the proper choice of words, the construction of sentences for clearness and force, the arrangement of sentences in the paragraph, and of paragraphs in the whole essay, for coherence and emphasis, are taught to the classes and applied in the criticisms. By the end of the second year, students are expected to have a practical command of these principles. Our standard for the admission of students to the third year course, namely, a minimum of sixty per cent. on all the English work of the second year, gives an assurance that those who enter the third year can write fair compositions. The composition work of the third and fourth years is now mainly technical. The third year students are required to write news reports of current conditions and happenings of interest to Ontario farmers, and to prepare press bulletins for publication in the agricultural press and in the country newspapers. The fourth year are required to prepare technical reports of exhibitions and judging rings, to write interviews with prominent agriculturists, and editorials whose aim is to form opinions. The instruction which our present staff is able to give in this line of work is necessarily rather general, and limited, for none of our staff happens to be a practical journalist. To supplement this instruction, last year Mr. Frederick Davy, editor of the *Central Canada Citizen*, gave a short course of one week's lessons to each of the graduate classes. I hope to be able to secure his services again this year, to repeat and to extend that instruction.

Another valuable addition to the work in English has been a two-year course in Public Speaking given in the second and third years. The results of that course are shown in the quality of the speeches that may be heard in the different class assemblies, and in the debates of the literary societies. Results are evident also in the readiness with which graduates adapt themselves to platform work at farmers' meetings.

The teaching staff has been greatly strengthened by the appointment of a permanent lecturer. There are now four instructors who devote part or all of their time to English. Mr. Hopkins, the dean of residence, reads the compositions of the first year; Mr. LeDrew, lecturer in economics, reads the second year com-

positions in the autumn term, and conducts the same class in public speaking in the winter term; Mr. Unwin, lecturer in English, divides the remaining work with me, and, besides, is instructor in German. I take this opportunity to commend the zeal and efficiency with which they have all done their work. Also, I wish to express high appreciation of the help which Mr. Davy gave us last winter in Journalism.

Besides the college work, I have been able in the year to accept a few outside engagements. I gave a number of addresses at evening meetings held in connection with short courses, at Cobourg, Warkworth, and Newmarket. In April I addressed the Farmers' Club of Portland, Maine, on the subject of "Farming in Canada." In May, I spent two weeks on Manitoulin Island and the North Shore addressing Teachers' Institutes. In July I addressed a farmers' picnic in North Hastings, and in October, Teachers' Institutes at Caledonia, Haldimand County, and at Guelph. The assistance given in the teachers' courses last year was continued this year, with eight lectures in the ten weeks' course and seven lectures in the four weeks' course.

I desire to thank the library committee for liberal appropriations on behalf of instruction in English, and yourself for your generous recommendations enabling this department to secure a permanent addition to the staff.

Respectfully submitted,

J. B. REYNOLDS.

PART III.

THE PROFESSOR OF ENTOMOLOGY AND ZOOLOGY.

To the President of the Ontario Agricultural College:

SIR.—I have the honor to present my sixth annual report on the work of the Department of Entomology and Zoology.

During the past year the work of instructing the students has occupied the greater part of our time and attention, forming, as it does, the most important portion of our duties at the College.

The first year, during the winter term, had a course in elementary Zoology, which included some practical work in the study of insects. The Second Year, during the fall term, had a regular course of lectures on Systematic and Economic Entomology, combined with practical work in the laboratory. In the Third Year courses extending through both terms were given on Systematic and Economic Entomology of a more advanced character. In all years the students are required to collect specimens for themselves, and these are made use of to a considerable extent in the practical laboratory work.

In the fourth year the Biological Option have had the full course in Vertebrate and Invertebrate Zoology, Anatomy, Physiology, Morphology and Histology, also advanced systematic work in Entomology, including Insect Anatomy, Physiology, Insects in relation to other animals, man and plants; Insect behaviour and distribution; and a course of lectures on the economic aspect of the subject. The students taking the Bacteriological Option have attended the lectures on Invertebrate and Vertebrate Zoology and Vertebrate Histology. Those taking the Horticultural Option have attended the lectures on Economic Entomology.

In common with the other departments we have found very great difficulty in arranging our classes in consequence of the largely increased number of students. The Second year has been divided into two sections, necessitating the duplication of the lectures. This also has been the case in the First Year and the practical work of the Third. Even after this subdivision some of the classes have still been much too large to be satisfactory. It is evident that the College will either have to provide increased accommodation in lecture rooms and laboratories, or else restrict the number admitted to the course.

In the Fourth Year five students took the Biological Option, four of them selecting Entomological subjects for their thesis, and one a Botanical subject Mr. A. C. Baker wrote a very voluminous essay on the "Aphids of North America," and produced a work of remarkable value, showing very careful study both in the field and in the laboratory. Mr. A. W. Baker's thesis was on the Mallophaga, a somewhat neglected order of insects. Mr. Vernon King chose for his special study the "Saw-flies of Ontario," and Mr. W. A. Ross the "Woolly Aphids of Ontario." After taking their degree of B.S.A., at the University of Toronto, these gentlemen have obtained excellent positions. Mr. A. C. Baker is employed as draftsman and systematic worker in the Bureau of Entomology at Washington. Mr. Vernon King is also employed by the same Bureau and is engaged in field work on insects affecting cereals. Mr. W. A. Ross is employed by the Division of Entomology at Ottawa as field officer for the Province of Ontario, his duties requiring him to inspect importations of nursery stock, and also the orchards. Mr. A. W. Baker

has been appointed temporary assistant in the instruction work of this Department, and it is hoped that he will become a permanent member of the staff. He has shown great ability in the work of instruction and we find him a most valuable and efficient assistant.

After the close of the regular College sessions we had a large class of Normal School students who had completed their preparatory training and come to us for Nature Study and other work preparatory to taking up school teaching. They were with us from April to the end of June, so that we were enabled to give them a fairly satisfactory course on the elements of Systematic Entomology, and much general information on the economic aspects of the study. The class was very large and consequently occupied a great deal of one's time, especially in the identification of specimens and assistance in practical work. They were very much interested in the course and enthusiastic in their desire for information, rendering it a pleasure to help them to the utmost of one's ability.

They were followed by the Summer School of Ontario teachers, which this year was also very much larger than usual and taxed our lecture-room capacity to the utmost. The work in connection with them was rendered very much more laborious than hitherto as some of the students had come back for a second term and others for a third, requiring three courses of lectures instead of only one. As this was one of the hottest months of the year, the work was certainly more arduous than could have been expected.

During the fall term now coming to a close the members of the Fourth Year taking the Biological Option are only two in number. The students in the Horticultural and Bacteriological Options are taking part in certain lectures, as mentioned already.

In addition to these classes, Prof. Jarvis has had a course of lectures throughout the year on General Zoology for the Normal class at the Macdonald Institute. He has also given lectures on the parasites of poultry to those taking the short course in that department.

Mr. Caesar gave a series of lectures to the Horticultural short course on insect pests and the spraying of orchards and fruit trees. He took part in Farmers' Institute meetings, giving addresses on injurious insects and plant diseases at Wellington in Prince Edward County, Frankfort and Stirling in Hastings County, Brighton and Bowmanville. He also gave an address on "Peach Diseases" at the annual meeting of the Ontario Fruit Growers' Association in Toronto, and on "Spray Mixtures for Apple Orchards and How to Apply Them" before the Quebec Society for the Protection of Plants from Insects and Fungus Diseases at its annual meeting at Macdonald College, St. Anne de Bellevue.

This is an outline of the various courses of instruction that we have given in this Department during the year now drawing to a close. With the efficient and zealous aid of my colleagues, Prof. Tennyson D. Jarvis and Mr. Lawson Caesar, we have been able to carry out the requirements of the curriculum in as satisfactory a maner as could be expected from the large numbers that we have had to deal with. It is a source of much gratification that both of these gentlemen have received deserved promotion, Mr. Jarvis having been appointed Associate Professor and Mr. Lawson Caesar Lecturer in this Department.

During the farmers' excursions in the month of June a Bureau of Information was maintained and was very much frequented by fruit growers and others who were desirous of procuring instructions as to methods of dealing with insects and weeds and of having specimens identified.

At the Toronto Industrial Exhibition towards the close of August we united with other Departments in making a large and comprehensive display in the Educational Building. It formed an attractive exhibit and enabled the visitors to obtain some conception of the varied character and extent of the practical work of the College.

During the month of November the Entomological Society of Ontario held its forty-eighth annual meeting in our lecture room. It was well attended by members from a distance as well as by those connected with the College, and proved to be of more than usual interest. The papers read were of a high degree of excellence and were greatly appreciated by those who heard them. A full report has been published by the Department of Agriculture.

Publications.

During the year the Ontario Department of Agriculture has issued a third edition of Bulletin 158 on "Insects and Fungus Diseases affecting Fruit Trees," by Professors Bethune and Jarvis, to which is appended a Spraying Calendar by Messrs. J. W. Eastham and L. Caesar. A second edition has been published of Bulletin 171 on "Insects Affecting Vegetables," by Professor Bethune, and "Fungus Diseases Affecting Vegetables," by Professor Howitt and Mr. Eastham. There has also been issued Bulletin 187 on the "Codling Moth," by Mr. Caesar—a pamphlet of forty pages illustrated by twenty-one figures from specially prepared drawings and photographs.

In May last I presented to the Royal Society of Canada my eleventh annual paper on the "Bibliography of Canadian Entomology," which will appear in the Transactions of the Society, now in course of publication. I have also contributed short articles on some troublesome insects to various newspapers and agricultural journals, and occasional notes to the "Canadian Entomologist."

Professor Jarvis has in course of preparation a Catalogue of the Hemiptera of the Dominion which is to form part of a general "List of the Insects of Canada," which the Entomological Society of Ontario has undertaken to prepare and which will be published in parts as from time to time they may be ready by the Geological Survey of Canada. The work when completed, will be a very valuable contribution to the biological literature of the country and will materially aid collectors and students of insects by informing them of the species that have been found in the various provinces and districts from the Atlantic to the Pacific. This comprehensive piece of work is divided amongst a series of Committees on the different Orders of Insects, the whole being under the guidance and superintendence of Dr. C. Gordon Hewitt, the Dominion Entomologist.

In addition to the Bulletin and Spraying Calendar already referred to, Mr. Caesar has contributed papers on "Spraying: Its Importance to the Fruit Grower," to the *Farmers' Advocate;* "The Control of Apple Scab and Codling Moth" to *Farm and Dairy;* and "Fall Spraying" to the *Canadian Horticulturist.*

Correspondence.

An important part of the duties pertaining to this Department is the answering of enquiries respecting insect troubles and giving information regarding methods of treatment. During the spring and summer months letters were received every day from all parts of the Province, and often from outside of it, wanting to know the name of an insect, its life history and economic importance, or desiring

advice for the control of some pest and relief from further attack. The number of letters received is steadily increasing and we find that the knowledge of injurious insects and the appropriate remedies for them is becoming more widespread year by year. This may be attributed to the publication by the Departments of Agriculture at Toronto and Ottawa of popular Bulletins and Reports, the instruction given here to hundreds of students annually; and the Nature-study courses for Normal School students and Ontario teachers. Each of these in his or her locality becomes a centre of information for the neighbourhood and thus the knowledge of common forms of insect and other animal life as well as of plants and weeds becomes more widely diffused.

Black Cut Worms.

One great benefit that we derive from our correspondence is the receipt of timely information respecting local outbreaks, and the extent of territory affected by the unusual form of attack. This year, for instance, letters were received from various places in the Thunder Bay district respecting the ravages of an army of black cutworms which devoured vegetation of all kinds and completely destroyed any crops that it attacked. Various methods were employed in addition to the use of the poisoned bran mash, such as checking the onward march of the caterpillars by deeply plowed furrows, and where the nature of the ground permitted crushing the hordes with a heavy roller; this was found to be the simplest and most effective method of dealing with them. It is comforting to know that these extraordinary outbreaks of caterpillars in vast numbers rarely, if ever, continue during the following year. Immense numbers of the worms no doubt fail to mature, owing to the want of food caused by the complete devastation of crops; fungus and bacterial diseases carry off myriads; destruction by parasitic and predaceous insects as well as by birds, skunks, snakes, and other animals further reduces the numbers; atmospheric influences cause additional havoc. Thus do we find that in nature the balance is soon restored.

Saw-toothed Grain Beetle.

During the summer letters, accompanied by specimens, were received from farmers and mill-owners stating that bins containing grain were infested by some small insect and that serious loss was being inflicted. In almost every case the presence of the depredator was discovered by the heating of the grain, which felt hot to the touch even during some of the warmest days in summer. This heating was evidently due to fermentation caused by the excrement of the insects mingled with the fine dust-like fragments of the grain that they had nibbled off. The cause of the trouble proved to be the Saw-toothed Grain beetle (*Silvanus surinamensis*), a small, dark-brown insect, about one-tenth of an inch long, slender in shape and much flattened above. Its name is derived from six saw-like teeth on each side of the prothorax. Both the beetle and its larva—an active grub—bite fragments off the grain and damage much more than they consume. Breeding goes on rapidly during the summer months, as many as six generations having been observed in a single season, and consequently the numbers of beetles and grubs may become enormous before cold weather sets in. The winter is usually spent in the adult beetle stage. In one instance the Granary Weevil, a small snout-beetle of somewhat similar habits, was found associated with it. These grain infesting beetles are widespread over the world and are a constant source of trouble wherever grain is stored. One is not surprised at their occurrence in mills where grain, of an

in old bags, is brought from various sources, but it seems surprising that they should have been found this year in the barns of isolated farms, and in several different counties of the province. Fumigating with bisulphide of carbon will kill the insects, but as the infested grain is worthless for milling purposes it is better to boil it and feed to pigs and poultry, and to clean thoroughly and scald the bins before storing fresh supplies of grain. The danger of loss from these insects should be a warning to farmers not to hold over their grain from one year to another.

An Enemy of the Potato Bug.

One of the most remarkable occurrences of the season was the appearance in considerable numbers of a predaceous bug which, in both its adult and nymphal stages, feeds upon the eggs, larvæ and mature forms of the Colorado potato beetle. In some localities these bugs were so numerous that our correspondents stated that the beetles were almost entirely got rid of without any necessity for spraying with Paris green. These bugs were identified for us by Mr. Van Duzee, of Buffalo, N.Y., as *Perillus bioculatus* and *claudus*, the latter being a black insect with red markings, and the former similar in appearance but without the red, its place being taken by dull yellow. From observations we have little doubt that these are merely the two sexes of the same species, the red form being the male. Forty years ago this insect was referred to in the Second Annual Report of the Entomological Society of Ontario as a foe to the Colorado potato beetle, and a figure of it was given with the name of *Perillus circumcinctus*. During the long intervening period since the publication of that report, its presence has very rarely been noticed in Ontario, though it is common enough in some of the States further south. It was to be found this year from Toronto westward to the St. Clair River, and usually in considerable numbers. Mr. C. W. Nash reports that in Toronto it was found feeding upon the Tussock Worms. It is to be hoped that this remarkably useful bug may remain with us and form one of Nature's checks for a very serious pest.

The Cotton Moth.

Another southern visitor that came to us in September and was to be found in large numbers from Ottawa to St. Thomas was the Cotton Moth (*Alabama argillacea*), whose caterpillars are very injurious to the cotton plant. It is by no means a rare visitor, its appearance having been recorded from time to time during many years past. Its migration to the north seems to be caused by a scarcity of the food plant on which the female may lay her eggs and also by prevailing southwest winds during the period when the moths are flying. Here we find them sucking the juices of fallen and rotting plums and other fruit, and also about electric street lamps at night, but they do no damage of any kind, there being no suitable food plants on which the caterpillars could live. In the month of July two specimens of a sub-tropical moth were taken in the Macdonald Hall by teachers attending the Summer School. It is a large, dark, brown insect (*Erebus odora*) that is said to be abundant in Central America, the West Indies and, to some extent, in Florida. Single specimens were found here and there in the northern States and Canada, hundreds of miles, perhaps, apart. The absence of its proper food-plant prevents the species from ever becoming established amongst us.

Fall Canker Worm.

Late in October, after several severe frosts had occurred, the woods in some localities were swarming with delicate white male moths of the fall Canker Worm, whose larvæ had been very numerous and destructive to foliage during the summer. Fortunately the female moth is wingless and therefore incapable of migrating to any distance. The caterpillars could easily be destroyed by spraying with Paris green when they first appear, if thought worth while to do so.

The Common Insects Are Always with Us.

Enquiries from correspondents have related to many insect pests that are always with us, many of which are extremely difficult to control, such as Wireworms, White Grubs, Aphids on all sorts of plants, and especially on turnips and cabbages in late summer. The San Jose, the Oyster-shell, the Cottony Maple and other Scale insects, the Spruce-gall louse which is now widely distributed, Clover and Raspberry Root-borers, Strawberry Weevils, Tree-hoppers and borers in shade trees.

Lady correspondents are constantly asking for information respecting the destructive Buffalo Carpet-beetle, and occasionally ask for remedies for Bedbugs, Cockroaches, Fleas and House flies. Other enquiries included such subjects as Cattle and Hog lice, how to get rid of Ground-hogs, the moral character of Red Squirrels as compared with the Grey and Black species, Slugs in shady city gardens, Ants' nests on lawns and bowling greens. An ear of nearly ripe corn was sent in which was very badly damaged by a Bumble-beetle, so called from the humming noise it produces when in flight and its resemblance in size and slightly in appearance to a Bumble-bee. The beetle appears in autumn and sometimes injures such soft fruit as ripe pears and peaches, scooping out great holes and devouring the luscious pulp. It is, however, rarely numerous and its attack upon corn is most unusual.

An interesting experiment was successfully carried out by the Rev. C. C. Waller, Principal of Huron College, London, for the control of Mosquitoes. He spent his summer vacation at Ravenswood in the county of Lambton, where there is a good deal of swamp affording suitable breeding places for tormenting mosquitoes. With the aid of members of his family and other summer visitors, he sprayed with coal oil the surface of all the pools in the neighbourhood, with the happy result that the community was free from the attacks of Mosquitoes during the rest of the season.

A large number of enquiries respecting spraying apparatus and materials and methods of using them were received and attended to by Mr. Caesar, who pays special attention to this part of the work of our Department.

BIOLOGICAL OBSERVATIONS IN EUROPE.

Professor Tennyson D. Jarvis.

Professor Jarvis, who for the last eleven years has been an efficient and painstaking instructor in this Department, was given some months' leave of absence for a well-deserved holiday. He took advantage of the opportunity to visit some

European countries in order to learn something of conditions, modes of life and methods employed in agriculture and fruit growing which differ in many respects from those he was familiar with here. The following is an outline of his travels and observations:

In selecting a holiday resort this year I decided upon an entire change of scene; and leaving the north country I sought change, refreshment and biological education in the semi-tropical countries of the Mediterranean and the western portion of Europe. Leaving home on the 25th of March, we travelled east to New York, where I spent a few days, the greater part of the time in the New York Natural History Museum, the aquarium at Battery Place, and the Zoological Gardens at Bronx Park. On the 29th of March we set sail for "sunny Italy." The voyage on the whole was very pleasant and the matters of interest were many, nature providing a wealth of items. By day the highly colored insectivorous fishes rising out of the sea several feet, the heavy-bodied porpoises doing their six-foot rise and dive, and the little bubble-like jelly-fishes lent variety to the day's routine, while the occasional spout of a passing whale added to our nature studies. Large flocks of American Sea Gulls followed our ship for three days and fed upon the waste material from the kitchen and other refuse. Patches of sea-weed were plentiful in the Mediterranean and looked like oases in a desert land. At night the waves breaking on the ship's sides threw off a phosphorescent light from the single-celled Protozoans, and gave us a kind of mystery from the depths, while up above the constellations lent their beauty to the sky. On the evening of the fifth day we saw the beautiful Peca, a volcanic mountain on one of the islands of the Azores, and a little later a large flock of birds, which indicated that land was near. On the morning of the sixth day we rose at five o'clock in order to watch our approach to the Azores, islands belonging to Portugal and inhabited by Portugese. When we reached the deck we were greeted with a spectacle which made me think I was still asleep and dreaming of a comic opera stage setting. The beautiful white, pink and yellow tints of the houses set on the background of the green mountains and the sun peeping over the tops of them created a color scheme which is impossible to describe. Breakfast was served at the usual hour, and as soon as that was over we scrambled down slippery steps and leaped into the arms of two husky Portugese sailors, who rowed us in small boats to the shore, singing their native songs to the strokes of the oars. At the landing we were encircled by a motley group, consisting of brown-eyed urchins asking for pennies, bare-footed girls offering pretty bouquets of tropical flowers, and old men and women in their native costumes. Our first visit was to the Borges Gardens, beautifully located on the side of the mountain. The typically tropical effect of the feathery foliaged date palms strikes one, on approaching the gardens, and this effect is deepened when, on entering the gardens one sees growing freely and strongly out-of-doors such home hot-house plants as Crotons, Hibiscus, Banana, Begonias, many species of Palms, Umbrella plant, Tree Ferns and Cacti. On the island we did not find a snake, lizard, frog, or fresh water fish, although the islands are sufficiently extensive, possess a mild climate, and are in every way adapted to support all these groups. We were delighted with the rich music of the birds. Conspicuous among them was the Yellow-and-Black Canary seen only in domestication in our own land. Blackbirds, Robins, Gray Wagtails, Azorean Bullfinches, and common Starlings were numerous and very active in song. As we passed we found a great variety of semi-tropical and tropical plants. The Climbing Purple-flowered Wistaria was in full bloom and the air was filled with its fragrance. The Baby Magnolia was new to me and very interesting. The Auricarias, commonly known as the Norfolk Island Pine, were most beautiful and towered above all the

other trees. The next was a careful search for insects, and to my surprise we found exceedingly few winged species. This may be accounted for by the fact that the winged forms would fly to sea and be drowned and eventually become extinct. A few species of beetles were found, but these, I found out later, were recent importations from Europe. The scale insects, thrips, mites, thysanurians, and other members of the Aptera were fairly plentiful everywhere. Ants, that are usually so abundant in warm countries, were exceedingly scarce here. A few earthworms and slugs were seen under stones.

From the Borges Public Gardens we were taken to the mountain top, where we had a splendid view of the surrounding country. Here could be seen a system of intensive farming, such as is seldom met with. Every plantation has been divided into very small plots which are walled in all around with brick and stone to a height of ten or twelve feet. Crops of corn, Irish potatoes, sweet potatoes, cauliflower, cabbage, horse beans, pineapples, strawberries and grapes were the common products of the farm. Though the implements used for cultivation were of a primitive nature, the cheapness of the labor rendered a high state of tillage possible. The old adze and the spade were two implements much used by the gardeners. From this elevation, too, we could obtain a magnificent view of the village and the bay.

Returning from the mountains on our way to the village, it was interesting to observe the high walls covered with ivy and other species of climbing plants. From time to time we could get glimpses through large black iron gates of the peasants working in the gardens. We met many of them going to and from the market with the products of the plantations. Oxen and donkeys were the animals most used in transportation. The native dress is very different from anything I had ever seen, that of the men consisting of homespun cotton, flax or woollen stuff. The dress of the women is known as the capote. It is a cloak of dark blue cloth, and has a hood of the same material, the latter shaped like a teapot cosy, but much larger. The back of it ends in a sweeping curve stiffened or held out by a wire. The whole outfit looks like the dress of a religious order. Display is not a part of the Portugese system of business. There is practically no distinction between a grocery store and a millinery shop until one goes inside. The windows are few and unattractive. In the market we tested several kinds of fruits, such as loquats, pineapples and strawberries.

Returning to the boat we found the water very rough and experienced much difficulty in getting from the rowboats to the larger ship. We were now on the ocean again and heading for Gibraltar. On the third day from the Azores, as we approached the straits, the mountains of Spain and Africa appeared like clouds over the sea, but soon we were sailing close by the northern side and could distinguish the scanty vegetation upon the side of the mountains, most curiously terraced and grooved by deep ravines. Gorse, a yellow-flowered shrub, was in full bloom and covered acres and acres of the mountain side. We were eagerly looking for the first glimpse of Gibraltar when suddenly, at about 9.30 a.m., we saw the top of the rocks over the mountains in the foreground. At 11 o'clock we had entered the harbor and anchored in full view of the gigantic fortress. Gibraltar certainly surpassed all the imaginary pictures I had made of it. After landing we first walked through the market-place—a typical Moorish market. In the poultry division killing and plucking were in active progress and turkeys were being driven in alive and prepared for sale right there. In the fruit division oranges, tangerines, fresh dates, figs, loquats and strawberries were offered for sale in abundance. We passed through a gate and found ourselves in a rather narrow,

bustling street which was alive with English soldiers. We soon came to the Alameda, a public garden, tastefully designed and rich in semi-tropical vegetation. Scarlet geraniums eight to ten feet high were pressed with other plants into luxuriant hedges. The Purple and Pink Bouganvillea were in full bloom and offered the most striking picture in the garden; Roses, Heliotrope, Callas, Cannas, Irises, Morning Glories. were other very conspicuous flowers. Aloes, Palms, Pines, Oaks, Almonds, Myrtles, Olive and Fig trees were also visible.

We then walked to Point Europea and were delighted with the great variety of native flora growing on the mountain side. The leguminous pea tree was in full bloom and showed off well on the green background. It was late in the day before we had satisfied ourselves with the gardens, and indeed we had not seen nearly all when the time for departing had arrived.

We hurried to the boat and found that it was just ready to start for Algeciras, a typical town in southern Spain, about forty minutes ride from Gibraltar. The first thing to attract our attention was what seemed to us a toy train. It was a real train, however, waiting for sufficient passengers to make it worth while to start.

Gardening on the roof is a feature of this place; every little house has some sort of crop growing amongst its tiles and eaves, presenting an interesting picture of urban agriculture. Even such large plants as the grape-vine were made to flourish and bear their fruits in luxuriance. In the evening we strolled back into the country and saw the peasants plowing the fields with their crooked sticks, shod with a long iron point; children gathering roots and small branches for firewood. Women were carrying huge bundles on their heads, and donkey-boys were urging their heavily-laden animals along the roadside. Women and children were gathering herbs for greens and medicinal physic. The dandelions and curled dock were in their baskets. Goats were pastured everywhere. We returned to the Hotel Reina Cristina, where we studied the plant life in the large gardens surrounding the hotel: Almond in full bloom, Acacia, Persimmon, Bamboo, Loquat trees, Roses, etc. In the morning we studied the habits of the seashore animals and made small collections of shells. It was now time to embark for Algiers, and bidding farewell to the coast of Spain, we proceeded to find our way back to the Cretic.

On the morning of the 10th we awoke to find ourselves gliding into old Algiers, one of the most beautiful harbours in the world. After breakfast we went through with the usual routine of landing, and, when we gained the shore, we were in the midst of a hurricane of conflicting sounds: Syrians, Arabs, Turks, Jews, Soudanese negroes and many other parasites were there wanting to pounce upon the first unwary American that came their way. We rode from the main street on the tramway out to the Jardin d'Assis, a public garden, where we saw many new and unfamiliar species of trees and shrubs. Some of those we determined were the Carob tree, a leguminous tree with sickle-shaped pods identified by some with the husks of the prodigal or with the locusts of John the Baptist: the Judas tree, with its beautiful pink blossoms, was a glorious sight; the Thorn tree, the thorns of which were used for the crucifixion; the tall and graceful Pepper tree, which furnishes most excellent shade.

We returned to the centre of the town and explored the Arab market place, which was very unlike a Canadian market. Here was offered for sale a mass of commodities which the average Canadian would pronounce unclean. Blood by the cubic centimetre, snails on the half shell, live squids, heavy, black, greasy-looking eels, crawling crabs and crayfish, and slimy jelly fish, besides all the internal

organs of these and other animals, were a few of the impossibles. There were good things on the market too, and here are a few of them: fresh dates, fresh strawberries, figs, loquats and grape fruit, sweet potatoes, phenoke, artichokes, lupines, and many of our own early vegetables.

April 11th was a great day on the boat. Everyone was anxious for the coming morning when we were to land at Naples. The deck became crowded with passengers, many of whom had just emerged from a two weeks' seclusion in the lower regions of the boat. There was great excitement on board, for we could already see Naples, and everything seemed strange and new. After we arrived inside the breakwater we had a fine view of the city at close range, with Vesuvius in the background. The Neapolitan beggars came up alongside of the boat: some of them sang and danced, while others played. We finally got alongside of the wharf, and then Bedlam was let loose: everybody wanted to go down first. We landed after all the baggage was set on the wharf, and then began the merry struggle in search of our luggage. We finally found it and had it taken to the customs house and passed. We then took a carriage and drove to a hotel and after some refreshments we sallied forth to see the town.

First of all we went to the Museo Nationale and saw many fine specimens from Herculaneum and Pompeii. We then went to the Villa Mazionalle and visited the aquarium, the second largest in the world. Some of the many interesting things we saw here were: the Electric Ray Fish, commonly known as the Torpedo, which was known to the ancients for its strange power of giving electric shocks. Its slimy body is almost circular in shape and contains two large electric organs. Each of these consists of several hundred of hexagonal columns of a gelatinous substance which are supplied with a number of branching nerves with curious terminations. These organs give rise to a strong electric current when the animal is irritated. To experience the whole shock the fish must be touched at the same time on both sides. The sea scorpion or sea devil, a fish with a broad head and mouth, large spiny fins and curious appendages on its skin in form of lappets, horns or ribands, hide themselves in the crevices of the rock, and can mimic the coloring so wonderfully that it is almost impossible to see them when at rest. Sea squirts with their semi-transparent bodies present a curious picture of still life. The cuttle-fish, squids and devil fishes are among the most interesting animals in the aquarium. Attached to the shells of hermit crabs we saw five or six sea anemones. It is evidently a friendly alliance which has sprung up from some mutual advantage gained. This consists so far as we could see in the hermit crab being protected by the poisonous stinging cells of the anemone. The anemones, on the other hand, get free transportation, thus having a greater chance of finding food. The beautiful tree corals with their long, sensitive tentacles respond readily to changes in temperature of the water. In some of the tanks swarms of very minute, lively shrimps play about over the sand like a swarm of flies..

The following morning we arose early and set out for Capri. This beautiful island is terraced and almost covered with olive trees. We next went into the Blue Grotto and were astounded by the wonderful phenomena. From Capri we went back to the boat and sailed to Sorrento. From here we walked part of the way to Amalfi and saw wonderful landscape.

The next morning we drove from Sorrento to Pompeii, studying the plant and animal life on the way. We returned to Naples in the afternoon and spent the evening walking the streets and making general observations on the habits of the natives.

We left Naples at 8.30 a.m. and arrived in Rome a little after 1. The trip was most delightful. The high degree of cultivation for a distance of about fifty miles was interesting to note. The peasants were busy in the open fields planting seeds and tilling the soil with their primitive wooden sticks pulled by roan-coloured oxen. On the right of us we could see a range of snow-capped mountains. It was our first glimpse of the Apennines. We passed along sometimes close beside them and sometimes with intervening slopes covered with vineyards and olive trees. The vineyards looked very different from ours—the vines were trained to short bamboo sticks and not put up in festoons as is practised in the Naples district. It was on my ride to Rome that I had my first experience with a victim of that most dreaded disease, Pelagra. It was a pitiful sight, indeed, to see the helpless state of this individual. I was informed by his physician that his present state was simply the result of the disease, that the organism itself had now left him. So far this disease has not reached us here in Canada, but it is getting fairly common in the middle and eastern States, and it looks as if our turn is coming. This terrible disease attacks the nervous tissues, causing paralysis and insanity, and even if the patient survives he is almost sure to be an invalid the rest of his life. The hope of mastering the disease seems to lie in the recent discovery that its spread is caused by an insect belonging to the genus Simulium, and known to Canadians as the Black Fly. Dr. Howard, Entomologist at Washington, has many assistants working on this species of fly in relation to the spread of the disease, Pelagra.

On our arrival in the Eternal City we were delighted with the beautiful buildings and cleanliness of the streets. In the city we spent a large part of our time studying the interesting kinds of architecture, and the beautiful statuary and paintings in the museums. These artistic treasures are a wonderful asset to the country in developing a high standard of beauty and morality. The drinking habits, on the other hand, must have a very strong counteraction on the morality of the race.

One day, to vary our experience in this wondrous city, we drove beyond the walls to the most interesting thoroughfare in the world—the Appian Way. The beautiful stone pine trees with long naked trunks and ball-like tops were conspicuous objects in the landscape. Little lizards were at play on the roads and in the grass. Many kinds of birds, such as the Southern Mocking Bird, were singing gaily in the branches of the olive trees. The air was fresh and fragrant with the odors from the early summer blossoms of the flowering Dogwood, Hawthorn, Citrus tree, and Wistaria. In the green grass were countless little pink daisies, blue violets and white anemones.

The excursions in the neighbourhood of Rome are charming, and would be full of interest were it only for the changing views they afford of the wild campagna. But every inch of ground in every direction is rich in association and in natural beauties. On our third Sunday in Rome we went to Tivoli on a little steam train. All along the route there were great fields of clover, alfalfa and meadows. Large patches of pink oriental poppies were conspicuous flowers in the meadows. We stopped at Hadrian's Villa and walked through the long avenues of Cypresses and then examined the ruins of this once magnificent villa. The fruit trees, pear, apple, cherry, etc., were in full bloom about a month in advance of those in Southern Ontario. It seemed a perfect paradise for the feathered tribe. We returned to the station and proceeded to Tivoli, where we saw many new and interesting species of plants. We returned to Rome at 6.15 after a most pleasant day's outing.

On our way from Rome to Florence we saw rolling fields of meadows dotted with buttercups and white daisies; small peasant villages with the natives at work in their gardens; clumps of elms, poplars and conifers and other interesting trees and shrubs. Florence is a very charming city and especially interesting from a biological standpoint. The hills and valleys surrounding the town furnish ideal conditions for the life of plants, birds and other animals. The famous Boboli Gardens on the banks of the River Arno compared very favourably with any gardens we had ever seen. The gardens are dotted with beautiful fountains and bits of statuary. The many species of ilex tree are the most conspicuous plants in the garden. It is a pleasant change to leave the art gallery and get rest and refreshment in this artistic garden.

Friday morning we started for Venice on the 6.30 train and arrived there early in the afternoon. The ride from Florence to Bologna is rather tiresome. The mountains are very high and beautiful, but it is all slow up-hill travel and passes through innumerable tunnels. From Bologna to Venice it is a flat country, well adapted to fruit growing and dairy farming. Arriving at Venice we were greatly surprised at the conditions. One comes out of the station and is greeted by hundreds of gondoliers shouting to take one to their hotel.

Venice, the Italian aquatic city, contrasted with a terrestrial city, shows many interesting comparisons. The numerous gulls and pigeons perform their duty as scavengers fully as well as the English sparrow does in the streets of Rome. In the place of green grass in front of the houses we have the pond lilies, water weeds and floating algae. Shade trees are very scarce, but as a substitute we have the covered steam yacht running up and down the Grand Canal. A few of the islands are reserved for public gardens and play-grounds for the natives. In the heat of the afternoon we sat under the trees here, tearing to pieces the parts of flowers in an effort to determine the species. Another interesting and attractive part of Venice is the Ledo or Adriatic shore, where we had a splendid chance to see a great variety of marine life in their natural haunts.

On Monday, May 1st, we left Venice for Milan, arriving there about one o'clock in the afternoon. The ride through this well cultivated country with the Alps in the background, showing their snow-capped peaks, was most beautiful. As we passed along we could see large hop plantations and small clumps of the mulberry tree. Mulberry leaves are used as food for the silk worm, and we were told that silk-worm culture was one of the chief industries in this part of the province. In Milan we saw a very large collection of caged birds and domesticated water fowl in the beautiful public garden near the station.

From Milan we went to Bellagio on Lake Como in northern Italy. At the town of Como we went to the top of the mountain by the incline car, and there studied Alpine insects, plants, etc. The ride up Lake Como was most charming. The high mountains covered with snow, the olive terraces, the wistaria overhanging the little summer homes and the beautiful sunset all add to make the most glorious picture. Here we again studied Alpine scenery and forms of insect and plant life, which was entirely new to me.

We then sailed back to Como and crossed the Alps to Lucerne, in Switzerland. On this trip we saw a great variety of interesting biological and geological scenery. At the stops we could hear the sweet song of the southern mocking bird, the chatter of the magpie or the jubilant outbursts of the thrush on a hawthorn nearby. The movements of the swallows and birds of prey were also interesting to watch. The peasants were cutting hay with scythes, raking it up with primitive wooden

rakes and loading it on carts with very low wheels, pulled by oxen. Men, women and children were working in the fields, and on the whole living a more or less natural sort of life. In the farmyards we could see goats, cattle and chickens. The native huts, simple in structure, surrounded by rosaceous trees and partly covered with ivy, looked very attractive to the tourist, and made some of them wish they could exchange the strenuous and unnatural life of the American citizen for the simple, natural, and wholesome life of the Swiss peasant. In Lucerne we continued our studies of Alpine plants and animals, and it was extremely interesting to note the height limits and the changes in form of insects adapting themselves to changed conditions and environment. These changes resulted in difference of colour and sometimes in size.

From Lucerne we went east to Munich, stopping at Zurich and Lindau on the way. In Southern Germany the land is rolling and well adapted for dairy farming. We were surprised at the absence of cattle in the fields and were told by natives that it was the practice in Germany to grow the crops outside and to feed them in the stables. This is certainly a very unnatural way of raising cattle, but it has a few advantages: more animals can be fed off one acre. The cows escape the flies, and time is probably saved by having them near at hand. It also does away with the ugly fence which is so common in America. However, this abnormal way of living without exercise always leads to tuberculosis and other diseases common to domestic animals.

In Munich we spent considerable time in the large Industrial Museum, examining specimens of biological interest, illustrated evolutions of agricultural products and miniature machinery. This is a very useful kind of museum and would be of great educational value at any agricultural institution.

From Munich we travelled northward to Berlin, visiting Nuremburg and Dresden on the way. In Berlin, and I may say in all the other German cities that we visited, we found ideal conditions for the development of the aesthetic nature. Public gardens were numerous, attractive, well cared for and afforded plenty of playground for the inhabitants. Some of the more important places visited were the Agricultural College in the centre of the city, the Natural History Museum, the Agricultural Museum, and the large and beautiful gardens at Potsdam, the home of the Emperor. In this northern country the native plants and animals are very similar to those found in Ontario.

From Berlin we travelled south-west to Frankfort and Mainz. At Mainz we boarded a steamboat and spent a glorious day on the River Rhine. The wooded hills, numerous old castles and the intensive agriculture on the hill slopes gave the river a very picturesque appearance.

We spent a few days at Cologne getting acquainted with the French people and their language, and then travelled on to Paris.

In Paris the chief centres of interest were the parks, gardens and Natural History Museums. We spent two days in the beautiful garden at Versailles: a more charming place could not be found anywhere—the stately avenues, the lofty hedges and the beautiful statuary and fountains in the gardens presented a beautiful picture.

After ten days in this interesting city we passed on to London, via Calais and Dover. In England and Scotland public gardens, picturesque estates, wooded hills, well-cared for highways and hedges, lakes and rivers, fruit plantations and meadows, song birds and wild game and natural scenery everywhere were almost sufficient to intoxicate the senses. It was like one huge park or garden dotted with

cities, towns and villages. Some of the plants that attracted our attention most were the fields of bluebells, the mixture of green grass and dandelions, the lilacs and rhododendrons, the fox gloves and peonies, the rose gardens and rockeries in the parks, the hollyhocks, poppies and campanile, beautiful azalias, and the ornamental waters containing pond lilies, lotus and other aquatic plants. Ilex trees, commonly known as holly, and large spreading beeches and elms were also very conspicuous objects in the landscape. The Agricultural Colleges at Wye and Holmes Chapel in England, and at Glasgow and Edinburgh in Scotland, were inspected, and some useful information on spraying for insects and diseases of fruit trees was obtained. Spraying is more commonly practised in England than in any other country in Europe. At the Natural History Museum, London, I worked over the collections of scale insects, Aleyrodis, and a few other families of Hemipterous insects. The collections of birds and their nests here were found very interesting.

After visiting most of the counties in England and Southern Scotland we travelled to Liverpool and on the 7th of July we said farewell to dear Old England and commenced our journey homeward, *via* Strait of Belle Isle and Quebec.

INVESTIGATIONS BY MR. LAWSON CAESAR.

After the close of the regular College course in April and until the return of the students in September, Mr. Caesar's time and attention were almost wholly devoted to outdoor investigations of insect attacks and plant diseases; these are conducted in various places where conditions are favourable for observation and which are otherwise convenient. The following is his report of work carried on during the year:

Better Farming Special Train.

At the request of the Fruit Branch he was on the Better Farming Special Train throughout the whole route and delivered addresses at all the important fruit centres visited. In order to make the work more beneficial and instructive he took with him an exhibit of insects, plant diseases, and spray mixtures, and was furnished with a number of complete spraying outfits, so that anyone in search of fuller information than could be given in the short addresses could come to the car containing these exhibits, look over what was there and ask further questions.

Spraying for Apple Scab and Codling Moth.

Soon after the College closed two apple orchards were selected about two miles north-east of Rockwood, and were sprayed by Mr. Caesar and his assistant, Mr. Chas. Good, to test once more the value of lime-sulphur and arsenate of lead in the control of the Codling Moth and Apple Scab, and also to observe the effects of the spray upon the foliage and fruit. One orchard contained 384 trees and the other about 255. The latter had never been sprayed before and the former had not been sprayed for about fifteen years. The lime-sulphur used was prepared in two large boilers at the former orchard and was most satisfactory in character, showing clearly that any fruit grower of average intelligence can make his own concentrated lime-sulphur. The cost was only about one-half of what it would have

been if the commercial wash had been purchased. Each orchard received one spraying just before the blossoms burst and another right after they fell. The results were most satisfactory, as observed by Mr. Caesar himself during the packing season in october, and as reported by the owner. The latter claimed that at least 95 per cent. of the fruit was free from both worms and Scab. Mr. Caesar says that this was true of all the Spy apples and other varieties that were sprayed before the calyces fell, but in the smaller orchard, which happened to be the one last sprayed, a few trees of earlier varieties could not be sprayed until the calyces were nearly closed and some of these had a considerable number of worms. The foliage on all was almost totally free from injury and the fruit glossy and without any russeting.

This is now the third year that Mr. Caesar has tested the lime-sulphur wash and arsenate of lead as a summer spray, and he is quite confident from the results obtained each year that these mixtures are very effective against our worst pests like Codling Moth and Apple Scab and that, if properly diluted, they will not burn the foliage or russet the fruit.

Plum Pockets or Bladder Plums.

On April 22nd before the buds had begun to swell a test was made of the possibility of preventing this very common and destructive disease of American plums known as Plum Pockets or Bladder Plums, a disease that many farmers think is caused by lightning or frost, but which is really due to a fungus closely allied to the one that causes Peach Leaf Curl. Four smallish trees a little to one side of a larger clump of trees were very carefully sprayed from all sides. Some of this spray blew over into the nearest side of the clump. All these trees last year had been observed to be badly attacked by the disease, in fact there was scarcely a fruit not affected. On June 13th these trees were examined and it was found that the fruit on the sprayed trees was in every case healthy and also most of that on the side of the unsprayed trees nearest the sprayed and upon which the spray had blown over. The rest of the unsprayed trees had 50 per cent. of diseased fruit. There seems therefore to be not the least doubt that lime-sulphur, if applied early in spring before the buds begin to swell, will control this disease.

Pear Psylla.

A number of experiments were planned to test the value of lime-sulphur applied at different dates in the spring as a means of control of the Pear Psylla. Three careful fruitgrowers participated in the experiment, but unfortunately for our test the Psyllas almost completely disappeared this year from both sprayed and unsprayed trees. Professor Parrot and his colleagues at Geneva, New York, have demonstrated that lime-sulphur, if thoroughly applied as late as possible before the leaves or bloom is out, will control this pest in a fairly satisfactory manner.

Cabbage Root-maggot.

Apterite, Clift's Manurial Insecticide, soft coal soot and tarred felt-paper discs were tested in the control of this very serious pest by Mr. Caesar with the co-operation of Mr. A. McLennan, of the horticultural department.

CABBAGE ROOT-MAGGOTS.

Substance used.	Number of plants treated.	Number that lived.	Percentage.
Apterite	170	110	64.7
Clift's manurial insecticide	171	82	47.9
Soft coal soot	69	42	60.9
Tarred felt-paper discs	648	587	90.6
None—check row	136	58	42.6

The Apterite and Clift's Manurial Insecticide were applied according to the directions of the manufacturers, and were worked into the soil before setting out the plants.

The soft coal soot and the discs were put on immediately after the plants were set out and before there were any eggs deposited.

The above table shows clearly that none of these so-called remedies were satisfactory except the tarred felt-paper discs. These were, in our opinion, a great success, even better than the table shows, because not all the plants that died were killed by the maggots, quite a large percentage having been destroyed by other causes. Moreover in one row of 199 plants where the discs were very carefully put on 189 plants lived and not more than five of those that died could be attributed to the root-maggot. From these results and those of several other experimental stations we strongly recommend the use of the tarred felt-paper discs for this pest.

In our work several important points about applying these discs were observed. First, only one-ply tarred-felt paper should be used and not the ordinary tar-paper, as the latter curls badly with the heat. Second, the discs must be applied at once after the plants are set out, in fact one man should follow the planter. If several hours or a day or more are allowed to elapse before they are put on the flies will often have laid their eggs in the soil around the plant and putting on the discs will not prevent the maggots from these eggs attacking the stem and roots and killing the plant. Third, care should be taken to see that the disc is set flat on the ground and fits closely and neatly to the stem of the plant so that the fly cannot work her abdomen down through any opening into the soil and lay eggs. Fourth, the soil should be very carefully cultivated before the plants are set out and then should not be cultivated again for a couple of weeks until the flies have about disappeared, for otherwise the soil will be thrown up on the discs and eggs will be laid on this. If it is found necessary to cultivate, it would be well to use a small whisk and brush the earth off the discs. This does not take so long as one would think.

We hope to devote more attention to the control of these and other root-maggots next year and to test other remedies.

CAPSIDS ATTACKING APPLES.

For some time we have been aware that certain scars and deformities of apples were to some extent at least caused by sucking plant bugs. This year our assistant, Mr. Good, was sent out to watch the work of the nymphs of one species of these bugs in a large Spy orchard at Woodburn, near Stoney Creek. Mr. Good found many of the bugs at work on the apples. Twenty or more of the nymphs were captured and brought to Guelph, where they were enclosed in

large paper bags on twigs with several fruits on them on Spy trees in the College orchard. Several apples showed the characteristic punctures and six of the insects were reared to the adult stage. We have not yet discovered the name of the species, but hope to do so soon and also to continue further investigations on how far this insect is distributed, how much damage it does, whether other species do similar work, and the life histories of the different species found. So far as our observations go all the injury is done by the nymphs while the apples are still very small.

Apple Maggot or Railroad Worm.

Many of the fruit growers east of Toronto, during the last few years, have urged upon us the desirability of making a study of the Apple Maggot to see whether some satisfactory and economical method of controlling it could be discovered. This pest is very much feared by owners of good orchards because they have seen or heard of its destructiveness and have been informed that spraying does not control it; hence they dread lest it should spread and destroy the apple industry. Mr. Caesar had been anxious for some time to begin investigation work on the insect, but could not devote the necessary time to it himself, especially as the insect is very seldom found in the neighborhood of the College. Accordingly he laid the case before the Horticultural Director and asked that a man might be stationed at Bowmanville to conduct the investigation. His request was granted and Mr. W. A. Ross, a recent graduate in Biology, was assigned to the work. It was not expected that one year's work would solve this problem, but the idea was to do as much as possible the first year and prepare the way for much more thorough investigation the next season. Mr. Ross has visited almost all the worst infested districts to learn just how much damage the Apple Maggot is doing, study varieties of apples or other fruits attacked and which of these the insect prefers; see how far it has spread, and discover what steps, if any, have been taken to control it. He has also made a good beginning in the study of the life-history of the pest and has performed a series of experiments on its control. Next year Mr. Caesar will have another assistant on the work and will also have the co-operation of Mr. Ross, who has recently been transferred to the Dominion Department of Entomology, Ottawa. We feel very hopeful that the result of this work will be of great benefit to fruit growers. As soon as it is completed the results will be published in the form of an illustrated popular bulletin.

Peach Diseases.

A year ago the Department of Agriculture asked Mr. Caesar to look into the question of the amount of damage that was being caused in peach orchards by the disease known as Little Peach. On his report that it was a very destructive disease, fairly prevalent, and that immediate steps should be taken to check its progress, he was sent to Michigan to see what methods of holding it in check were practised there. The information gained by this trip and also the results of his own observations were published in Bulletin No. 185.

This year the Department again requested him to give all the aid he could to the peach growers. Consequently he spent all the month of August and part of September in visiting the different inspectors and going around with them in their work so as to help them to be able to recognize the symptoms more easily and to encourage them to do their work thoroughly. It was his intention as soon as he had finished this side of the work to hold an orchard demonstration meet-

ing in each district, and to show each grower the symptoms of the disease, practice him in identifying it, and then give an address before the meeting broke up telling what was known about the disease, how destructive it was as illustrated by what they saw during the demonstration, and what steps would hold it in check. Time, however, permitted of holding only two of these meetings, one at Fonthill and the other at Grimsby. Both were remarkably well attended in spite of its being picking time. Much progress has been made this year in the work. A great deal more study and time, however, will be required before we can feel that this disease and Peach Yellows are being fought as they should be. Mr. Caesar says that over 50,000 trees have been marked by the inspectors and destroyed this year. This is about 4½ or 5 per cent. of the total number of peach trees in the Niagara district.

A phase of the disease that will require very careful further study is the danger of distribution through infested nursery stock. It is possible for a thoughtless or ill-informed nurseryman to take buds from diseased trees and bud his seedlings with these. Such nursery trees will almost all take the disease, though it may not show up for some time. Of course the nurseryman would not take buds from trees he knew were diseased, but many trees are affected and yet the symptoms are not visible or are difficult to detect at first. Moreover, in some cases there is so much of the disease in an orchard that it is not safe to take buds from any tree in it. Most of our nurserymen are trying to do all they can to see that their nurseries are absolutely free from the disease, and as the result of another season's work we feel confident that all will see the importance of the utmost care.

The results of Mr. Caesar's work and study of Little Peach and Yellows, and the recommendations he has made for the better control of them will be found in the Fruit Branch Report of 1911 under the heading of " Peach Diseases in Ontario."

Nursery Investigation in New York State.

At the request of the Fruit Branch of the Department of Agriculture Mr. Caesar was sent to New York State in October to gather information on their nursery methods compared with our own, and especially to see what methods were employed by their nurserymen and inspectors to keep Peach Yellows and Little Peach and other diseases from spreading either in the orchard itself or through diseased nursery stock. A little over a week was spent at this work, and nurseries at Rochester, Honeoye Falls, Geneva, and Dansville were visited. Some of the large peach orchards were also inspected and interviews were held with two of the leading inspectors. Prof. Crow, of the Horticultural Department, accompanied Mr. Caesar for three days on this work. A good deal of valuable information for the Fruit Branch was obtained.

Apple Orchard Demonstrations.

Three demonstrations were held in well sprayed orchards in September. Two of these were in Prince Edward County and the other in Elgin. The attendance was fairly good and many valuable points in the care of an orchard and the methods of securing clean, large fruit and more of it were pointed out in a very effective maner. A well planned orchard demonstration meeting is an excellent method of helping towards the better growing of fruit.

Lime-Sulphur Investigations.

As all the copies of the old bulletin on the lime-sulphur wash, No. 177, have already been distributed Mr. Caesar has been devoting whatever time he could get to the preparation of a new and much improved bulletin on this subject. He hopes to have this ready for the press by the beginning of the New Year. Many new and valuable matters connected with this popular spray mixture have been discovered since bulletin No. 177 was written. These will be incorporated in the new one (No. 198), and a revised copy of the Spray Calendar will also be included.

The Museum.

During last winter the large collection of objects of interest of various kinds, purchased from Captain Spain, of Port Dover, has been arranged and placed on exhibition in the museum. It consists of a large collection of corals, shells and various specimens of natural history, forming a very interesting and valuable addition. Mr. E. V. G. Orme, of Brampton, spent several weeks in arranging the collection and in going over, cleaning, labelling, etc., the biological collections. The Museum is now in excellent shape, all the articles, as a rule, being properly labelled and neatly arranged. The collections of insects were carefully gone over during the summer months and treated, when necessary, with bisulphide of carbon to destroy any museum pests that might be present. Since Mrs. Potter's removal no additions have been made to the display of wax representations of fruit and vegetables. The collection, however, is so large and fairly complete that it hardly needs any additions to be made to it.

Apparatus.

The ordinary materials for laboratory work have been procured from time to time, and in addition two binocular microscopes have been purchased from the makers in Budapest, Austria. These are very satisfactory instruments and are largely used where only low powers are required.

A series of microscopical slides, illustrating histological work, has also been procured.

Additions are constantly being made to the stock of Riker mounts, which are largely used for exhibition purposes and in illustration of lectures.

Respectfully submitted,

CHARLES J. S. BETHUNE.

PART IV.

THE PROFESSOR OF BOTANY.

To the President of the Ontario Agricultural College:

SIR.—I have the honour to submit my first annual report for the Department of Botany.

In May Mr. J. W. Eastham resigned to accept a position with Mr. Gussow, Dominion Botanist at Ottawa, and on September the first Professor McCready also resigned from the head of the department to devote his whole time to Nature Study and Agricultural Education in Ontario. On September first I had the honor to be appointed Professor of Botany, and Mr. W. A. McCubbin was appointed Lecturer in Botany. Mr. McCubbin comes to the department well prepared for his work, being an M.A. of Toronto University and having taken a year post-graduate work in Mycology at Harvard University.

The changes in the personnel of the staff have made necessary a rearrangement of the academic work of the department. I have taken charge of the first and second year work in general Botany, assisted by Messrs. McCubbin and Baker, and of the fourth year work in Systematic Botany and Plant Pathology. Mr. McCubbin is in charge of the Cryptogamic, Physiological, and Histological Botany of the third and fourth years.

During the past year several new microscopes and dissecting lenses were added to the equipment of the department, and an excellent camera for field and laboratory work was purchased. Each year the number of students in all classes increases, and hence it is necessary to constantly increase the laboratory equipment in order that every student may be properly supplied with the appliances necessary for thorough work in Botany.

TEACHING.

Lectures and laboratory work in Botany are given to the students of all years and take up the major portion of our time. In all the courses an endeavor is made to emphasize the economic and practical side of Botany without neglecting the necessary scientific principles, which are the foundations of such a study.

First Year. Lectures and laboratory work are given during the fall term on the morphology of the roots, stems, leaves and flowers of plants with the object of giving the students sufficient knowledge of the structure of plants and of botanical terms to enable them to use a key in the identification of common weeds and wild plants.

Second Year. During the fall term time is devoted to the further study of the structure of plants and to practice in their identification Lectures are given on the characterisics of the more important families of plants and on the identification and control of weeds. In the spring term lectures are given on elementary plant histology and physiology and upon the nature and methods of control of the most injurious fungus diseases of the field, orchard and garden. The afternoon laboratory periods are largely taken up in the examination and identification of weed seeds and in practice in making purity tests of samples of clover and grass seed.

Third Year. In the fall term lectures are given on Cryptogamic Botany, which are supplemented by laboratory work in the examination of typical members of the chief groups of the Plant Kingdom. The object of this course is to give the student a broad, general knowledge of the Plant Kingdom and a foundation for his work in the Plant Pathology of the fourth year. During the spring term lectures and laboratory work are given in Plant Physiology and Histology.

Fourth Year. During the fall term the Agricultural specialists are given a laboratory course in the identification of grasses and forage plants, and in the spring term a course of lectures on Plant Pathology, special attention being given to the diseases of cereal and vegetable crops.

The students in the Biological and Horticultural options are given special courses during the fall and spring term in Plant Pathology, Systematic and Cryptogamic Botany, and in Plant Histology and Physiology.

Students at Microscopic Work.

Short Courses.

The work of the department is by no means restricted to the regular class work of the College. Lectures and demonstrations are given in January to the short course classes in Seed Judging and Horticulture, and during the spring and summer months much time is devoted to giving the students in Elementary Agriculture and Nature Study some knowledge of the common trees, shrubs, flowers and weeds, and of the impurities in clover and grass seed.

Correspondence.

During the past season, 1910-1911, the correspondence has shown a very marked increase. Special interest has been shown by farmers, seed merchants and teachers in weeds, weed seeds and plant diseases. In the spring months numerous samples of clover and grass seed were submitted for purity test. This important work takes a great deal of time, but no time is wasted that is spent in helping farmers and seedmen to secure clean seed.

WEEDS.

Analysis of the correspondence received during the past twelve months indicates that the following weeds have attracted most attention during the past year: Field Bindweed (*Convolvulus arvensis*); Russian Thistle (*Salsola kali,* var *tenuifolia*); Bladder Campion (*Silene latifolia*); Crab or Finger Grass (*Digitaria sanguinalis*); Salad Rocket (*Eruca sativa*); Silverweed (*Potentilla anserina*); Perennial Sow Thistle (*Sonchus arvensis*); Water Hemlock (*Cicuta maculata*); Dodder (*Cuscuta sp.*); Penny Cress or Stinkweed (*Thlaspi arvense*); Ground Cherry (*Physalis viscosa*); Horsetail or Scouring Rush (*Equisetum arvense*); Poison Ivy (*Rhus toxicondendron*); Purple Goats' Beard or Wild Salsify (*Tragopogon porrifolius*); and Paint Brush (*Hieracium aurantiacum*).

Russian Thistle (*Salsola kali,* var. *tenuifolia*).

This weed has been widely spread in Ontario as an impurity in alfalfa seed during the last few years. It is very conspicuous and hence has attracted much attention and caused considerable alarm to alfalfa growers. Numerous specimens of it were sent in for identification during the past season. It is a nearly smooth, bushy branched annual, from 1 to 3 feet high. Mature plants are more or less spherical in form. The leaves are awl-shaped, one to two inches long, soft and fleshy when young, very prickly, pointed when mature. The flowers are inconspicuous, being small, without petals, and solitary in the axils of the leaves. The plants, when ripe, break off at the surface of the ground and are rolled about by the wind, scattering their numerous seeds on their journey. It is this tumbling habit that makes this weed particularly adapted to the prairie lands of the West, and it probably never will be a serious pest in Ontario, where fences, trees and other obstructions will prevent its being spread far and wide by the wind.

Eradication: The Russian Thistle, being an annual, is not hard to exterminate. If once cut off at the surface of the ground it never grows again, and hence in well cultivated fields is not likely to prove a pest. A single plant produces an enormous number of seeds and, if a few specimens are allowed to mature, they will seed down a whole field and cause serious trouble the following year, especially in a crop which does not allow of the frequent use of the cultivator. The chief danger lies in neglect. Care should be taken to destroy any plants that may appear in fields, fence corners or waste places before they go to seed. If a field is neglected until it becomes seeded, repeated plowing will be required in order to clean it.

Crab or Finger Grass (*Digitaria sanguinalis*).

This grass appears to be spreading in Ontario; many enquiries were received about it during the past season. It gives trouble both in lawns and cultivated fields. It is easily recognized as the flowers are produced in spikes, which come off from the stem like the fingers on the hand, and hence the common name, Finger Grass.

Eradication: Repeated cultivation after harvest will do much to destroy it. A well cared-for hoed crop is one of the best methods of dealing with it. In lawns spud out the patches, stir the soil with a rake and sow heavily with pure lawn grass seed when the ground is moist.

Water Hemlock or Spotted Cowbane (*Cicuta maculata*).

Several complaints were received of this weed poisoning cattle during the past spring. The poisonous nature of the plant has long been known. In the spring when pasture is scarce, cattle frequently find this weed in low, wet places and eat the roots, with fatal results. It is a smooth perennial, from 2 to 5 feet high, with compound leaves of two or three divisions, the stalks with expanding bases which clasp the stem, the leaflets lance-shaped and sharp toothed. The flowers are small, white and in flat-topped clusters (umbels). The root consists of a number of spindle-shaped "tubers."

Eradication: Care should be taken to watch low fields in which cattle are pastured, for this weed. If specimens are found, they should be dug out, dried and burned.

Wood Horsetail (*Equisetum sylvaticum.*)

In May a letter was received from near Sundridge, Ontario, with a specimen of Wood Horsetail enclosed. The contents of this letter were to the effect that a number of cattle had apparently been poisoned by eating some weed and that the only species present in the field was the one enclosed. The cattle were reported to be bloated, scrawny and without appetite. From the letter it appeared that the Wood Horsetail must have caused the poisoning, though of this it was impossible to make certain. The Field Horsetail (*Equisetum arvense*) is known to be poisonous to horses, especially when dry in hay. It is, therefore, not unlikely that Wood Horsetail may be poisonous to cattle.

FUNGUS DISEASES.

The season of 1911 was not remarkable for any very serious outbreaks of fungus diseases in Ontario. Numerous letters were received, however, enquiring about a great many different kinds of plant diseases. Some of these, judging by th reports concerning them, appear to be becoming more prevalent and more destructive in Ontario. These are given special attention in this report.

The following are among the diseases on which information was supplied: Loose Smut of Wheat (*Ustilago tritici*); Crown Rust or Red Rust of Oats (*Puccinia coronata*); Leaf Spot or Shot Hole Fungus (*Cylindrosporium padi*) on peach and cherry; Sooty Blotch of Apples (*Leptothyrium pomi*); Orange Rust of Raspberry and Blackberry (*Gymnoconia peckiana*); Hollyhock Rust (*Puccinia malvacearum*); Loose Smut of Oats (*Ustilago avenae*); Stinking Smut of Wheat (*Tilletia foetens*); white "Rust" of Salsify (*Cystopus tragopogonis*); Powdery Mildew of the Rose (*Sphaerotheca pannosa*); Pear Scab (*Venturia pyrina*); Potato Scab (*Oospora scabies*); Leaf Spot of Pea (*Septoria pisi*); Brown Rot of Stone Fruits (*Sclerotinia fructigena*); Bacterial Blight of Beans (*Pseudomonas phaseoli*); Corn Smut (*Ustilago zeae*); Powdery Mildew of Phlox (*Erysiphe cichoracearum*); Leaf Blotch of Rose (*Actinonema rosae*); Leaf Blotch of Horse-chestnut (*Phyllosticta paviae*); Late Blight of Potatoes (*Phytophthora infestans*); Stem Blight of Asters (*Fusarium* sp.).

Loose Smut of Wheat (*Ustilago tritici*).

This disease is becoming more widely spread and more serious each year in Ontario. Judging by the numerous enquiries received concerning it during the past year, it would seem that its life history and the methods for its prevention are not well understood. Loose Smut of Wheat cannot be prevented by the formalin or blue stone treatment, such as is used so successfully to prevent Stinking Smut of Wheat and Loose Smut of Oats. The reason for this is found in the difference in the life histories of the fungi which cause Stinking Smut of Wheat and Loose Smut of Oats, and that of the fungus which causes Loose Smut of Wheat. In the case of the two former diseases, the fungi winter over as spores upon the seed, while in the latter disease the organism is carried over the winter by fungus threads within the seed. A solution of formalin readily reaches and destroys the spores upon the seeds, but cannot reach the fungus threads within the seeds, and hence is not effective in preventing Loose Smut of Wheat. Many men do not distinguish

Stinking and Loose Smut of wheat.

between these two diseases and apply the bluestone or formalin treatment for both and cannot understand why the treatment often fails to prevent the smut. Since Stinking Smut or Bunt *can be prevented* by the formalin or bluestone treatment, while Loose Smut of Wheat cannot be prevented by such treatment, it is very important that farmers should learn to distinguish between the two kinds of smut. This only requires a little observation, as the difference between the two diseases is very marked. Stinking Smut or Bunt attacks only the grains, causing them to become short and plump, and filled with a dark brown powder which has an odor like decaying fish. The chaff is not attacked. Loose Smut attacks both the grains and the chaff and reduces them to a dark brown powder which has no foetid smell. Very frequently only the axis of the "head" is left, the grains and chaff having been reduced to powder and blown away by the wind.

Treatment for Loose Smut of Wheat: This disease can be prevented by a special hot water treatment of the seed. A full account of this method is given

in our last annual report. It is, however, a difficult and tedious treatment to apply and, therefore, the best and easiest way of preventing loss by this disease is to secure seed from a district where the Loose Smut is not present. Such seed will give a smut free crop.

Red Rust or Crown Rust of Oats (*Puccinia coronata*).

This rust was very prevalent in Ontario during the past season. Several correspondents complained that it was seriously damaging their oat crops, and some mentioned in their letters that it was particularly bad in fields near which Buckthorn shrubs (*Rhamnus cathartica*) were growing.

Buckthorn (*Rhamnus cathartica*).

Red Rust or Crown Rust of Oats is very similar in character to the ordinary rust of cereals (*Puccinia graminis*). It causes numerous small, orange-colored spots upon the surface of the oat leaves, and to a lesser extent upon the straw. It differs in its life history from the ordinary rust of cereals in that it produces its cluster-cup or aecidial stage upon the Buckthorn and not upon the Barberry. In the spring upon the lower surface of the Buckthorn leaves, irregular yellow pustules are frequently to be observed. These, upon examination with a hand lens, are seen to be composed of numerous little cups, which are packed with minute spores known as aecidial or cluster-cup spores. These spores are blown to the oat

plants and produce upon them the Red or Crown Rust. While this rust may exist and do serious harm without the presence of the Buckthorn, it is undoubtedly true that it can multiply very rapidly upon the Buckthorn, and this accounts for the fact that this rust is always noticeably worse in oat fields near which the Buckthorn grows. The Buckthorn is found growing wild in many parts of Ontario and is quite frequently used for hedges and ornamental purposes. It is a shrub or small tree from six to eighteen feet high with glossy ovate green leaves and thorny branches. The flowers are small and inconspicuous, being greenish in color. The berries are spherical, black in color and very bitter in taste. The writer believes that it would pay the farmers to destroy the Buckthorn growing in or near their grain fields, and thus do away with the means by which the fungus which causes the Red or Crown Rust of Oat multiplies itself so abundantly.

Hollyhock Rust (*Puccinia malvacearum*).

This is one of the worst troubles with which growers of Hollyhocks have to contend. The leaves of the plants are quite frequently completely destroyed by this disease. It is most noticeable on the under surfaces of the leaves, where it produces very distinct brown pustules, often in very large numbers. If the attack is severe the leaves dry and wither up.

Remedial Measures: (1) The destruction of the diseased parts of the plant in the fall, as the spores survive the winter upon them, and produce infection again in the spring.

(2) Picking off and burning in the early spring the leaves first showing signs of the rust and thus preventing its spread.

(3) Spraying thoroughly with Bordeaux mixture as early in the spring as possible. Spraying has the drawback of disfiguring plants used for ornamental purposes.

(4) All the Wild Mallow plants in the vicinity of the Hollyhocks should be destroyed, as they harbor the rust.

Rose Leaf Blotch (*Actinonema rosae*).

Many complaints were received this past season concerning the spotting and destruction of rose leaves by a fungus disease. Examination of specimens sent to the department revealed the fact that the trouble was due to a common disease of cultivated roses, known as Rose Leaf Blotch. This disease is present nearly every season and in some years proves very injurious. It causes irregular black or brown spots upon the leaves which often spread and run together so that nearly the whole of the leaf is discolored. In severe attacks the plants are often partly defoliated by the disease.

Remedies: Remedial measures for the disease are gathering up and burning all the diseased leaves and trimmings from the rose bushes; spraying with Bordeaux mixture early in the spring before the bushes leaf out, and, if the disease does appear on the leaves after such treatment, spraying thoroughly with ammoniacal copper carbonate, which will not disfigure the foliage.

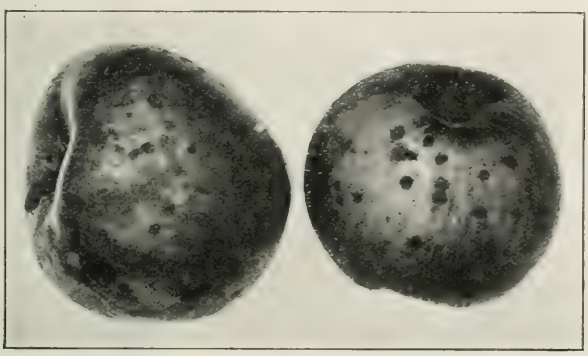
Blight of Ginseng (*Alternaria panax*).

Ginseng growers report that this disease was abundant during the past season. A full description of it is given in our Annual Report for 1907. Correspondents have been recommended to spray with Bordeaux mixture in order to control this

disease, and those who have tried this remedy report that they have had very satisfactory results from it. When Ginseng Blight has been serious the spraying with Bordeaux mixture should be begun early in the spring, as soon as the plants come through the ground and should be kept up throughout the season, every ten days or two weeks.

Sooty Blotch of Apples (*Leptothyrium pomi*).

Several lots of apples disfigured by this disease have been sent to the department this fall, and it has been noticed to be very common upon Spy apples offered for sale in the stores of Guelph. The disease is easily recognized by the characteristic, irregular, sooty blotches which it causes upon the fruit. The blotches may



Sooty Blotch of Apples. (*Leptothyrium pomi*).

be few and scattered or numerous, and often coalescing so as to give a sooty appearance to a considerable area of the surface of the apple. The apples are disfigured and rendered unattractive, but the flesh is not injured as the fungus does not penetrate below the skin. This is a disease chiefly of neglected orchards, as it is not found doing serious harm in orchards that are properly pruned and sprayed.

INVESTIGATIONAL WORK.

Owing to increased academic duties due to the large summer classes in Ele mentary Agriculture and Nature Study, and to the fact that the Department was short-handed all summer in consequence of Mr. J. W. Eastham's resignation in May, and his successor not being appointed until September, it has been impossible to investigate very many important topics which come under the scope of this department. Some investigations, however, were made on the destruction of weeds by chemicals, and on the impurities in clover and grass seed in Ontario. Observations were also made of the final results of some experiments conducted in the summer of 1910 on the control of Black Rot of Apples.

The Destruction of Weeds by Chemicals.

This work was carried on by Mr. Chas. E. Petch, a fourth year student in Biology, under the directions of this Department. The object of the experiments

Sheaf of Oats on left from plot sprayed with 20 per cent. solution iron sulphate; in the middle from plot sprayed with 10 per cent. solution; and on the right from the unsprayed plot.

On the left Ragweeds from unsprayed plot; in the middle Ragweeds from plot sprayed with 10 per cent. solution of iron sulphate; and on right plants from plot sprayed with 20 per cent. solution.

was to test the efficiency of solutions of various chemicals in the destruction of different kinds of weeds. Such chemicals as iron sulphate, sodium arsenite, crude carbolic acid, ammonium sulphate, common salt and sulphuric acid were tried in these experiments. Some of the results are sufficiently promising to warrant including a synopsis of them in this report.

Experiment with White Cockle.

One plot of White Cockle was sprayed with a 20 per cent. solution of iron sulphate and another with a 30 per cent. solution. In both plots the plants were in full bloom when sprayed. The results with the 20 per cent. solution of iron sulphate were not satisfactory, only a few of the younger plants being slightly damaged. The results with the 30 per cent. solution were much more promising, nearly all the White Cockle plants being sufficiently damaged to prevent them from ripening seed. The older plants which were maturing seed were the only ones not badly damaged by this strength of the solution. No harm resulted to the clover in either plots beyond a blackening of the plants for a few days. This experiment indicates that White Cockle can be prevented from producing seed by a thorough spraying with a 30 per cent. solution of iron sulphate just as the plants are coming into bloom.

Experiments with Ragweed.

Two plots of Ragweed in an oat field were sprayed with iron sulphate in June: one with a 10 per cent. solution and the other with a 20 per cent. solution. The Ragweed plants in both plots were about six inches high when sprayed. A heavy shower coming up shortly after spraying made it necessary to re-spray. At harvest time the Ragweed plants in the sprayed plots and in an unsprayed plot of equal size were counted and the yield of oats per acre estimated; 125 Ragweed plants were found in the plot sprayed with the 20 per cent. solution, 642 in the plot sprayed with the 10 per cent. solution, and 1,826 in the unsprayed plot. The yield on the plot sprayed with the 20 per cent. solution was 20 bushels per acre, on the plot sprayed with the 10 per cent. solution 15 bushels per acre, and on the unsprayed plot 4 bushels per acre. These results indicate that a 20 per cent. solution of iron sulphate can be used with profit to destroy Ragweed in cereal crops.

Experiments with Poison Ivy.

A 30 per cent. solution of common salt and a 12½ per cent. solution of crude carbolic were tried upon Poison Ivy. The best results were obtained with the crude carbolic. These indicate that Poison Ivy can be destroyed by spraying with a 12½ per cent. solution of crude carbolic acid three or four times in a season at intervals of about three weeks.

CLOVER SEED INVESTIGATIONS.

Investigations on the purity of clover seed in Ontario have been carried on during the last four years. It is hoped to publish the results of these in a bulletin in the near future. In the spring of 1911 this work was carried on by Mr. C. A. Galbraith, a fourth year student, who prepared his thesis on this subject. The following is a brief synopsis of the results of Mr. Galbraith's investigations:

Red Clover.

Out of 71 samples of red clover seed examined, 57 contained Green Foxtail; 47 Buckhorn or Rib-grass; 41 Lamb's Quarters; 31 Ragweed; 23 Lady's Thumb; 21 Night-flowering Catchfly; 15 Curled Dock; 12 Mayweed; 10 Black Medick; 9 Yellow Foxtail; 8 Canada Thistle; 6 Pigweed; 6 Stickseed; 4 Barn-yard Grass; 4 Bladder Campion; 4 Broad-leaved Plantain; 3 Catnip; 3 Wormseed Mustard; 2 Wild Mustard; 2 Sheep Sorrel; 2 Round-leaved Mallow and Cow Cress. Prickly Lettuce, Cinquefoil, Ox-eye Daisy, False Flax, Motherwort, Blue Weed, and Spiny Annual Sow Thistle were found in one sample each.

Only one sample was entirely free from weed seeds, and only twenty-one graded No. 1. Of the fifty samples which did not grade No. 1 Ragweed was present in twenty-four in quantities varying from 1 to 112 per ounce of red clover, and Buckhorn or Rib-grass was present in eighteen in quantities varying from 10 to 85 seeds per ounce.

Alsike.

Ninety samples were examined Night Flowering Catchfly was found in 77; Black Medick in 57; Sheep Sorrel in 35; Curled Dock in 45; Canada Thistle in 36; Lamb's Quarters in 42; Green Foxtail in 38; Mouse-eared Chickweed in 18; False Flax in 21; Shepherd's Purse in 13; Wormseed Mustard, Lady's Thumb and Catnip in 9 each; Old Witch Grass in 7; Buckhorn in 7; Stickseed in 6; Wild Mustard in 5; Pepper Grass in 5; Ox-eye Daisy in 4; Heal All in 4; Broad-leaved Plantain, Pigweed, Cinquefoil and Bladder Campion in 3 each; Black Bindweed in 2; Rugel's Plantain and Penny Cress in one each.

Twenty-three samples in all graded No. 1. Of these seven contained from six to ten seeds named in the Weed Seed Control Act to every ounce of Alsike, and thus barely came within the requirements of the Act, and were far from being desirable for seeding purposes.

Impurities in Alfalfa Seed.

Within the last few years the farmers in Ontario have gone in very extensively for alfalfa, and there has been a great demand for the seed. Much of this seed has of necessity been imported from Europe and from the Western States. In this way many new weeds have been introduced into Ontario as few samples of imported alfalfa seed are entirely free from weed seeds. In the purity tests made by the department the following seeds of weeds new to Ontario have been found in many of the samples: Salad Rocket (*Eruca sativa*); an European Corn Flower (*Centaurea picris*); Western Sunflower (*Helianthus maximiliani*); Johnson Grass (*Sorghum halepense*); Gum plant (*Grindelia squarrosa*); Barnaby's Thistle (*Centaurea solstitialis*); and Russian Thistle (*Salsola kali*, var. *tenuifolia*). This last weed has been found in waste places in Ontario for many years, but not to any extent in cultivated fields until alfalfa became so popular.

Experiment with Black Rot of Apple.

During the summer of 1910 the opportunity presented itself of undertaking an experiment in the control of this disease in the orchard of the Asylum, London, Ontario. A large number of apple trees were treated for this disease. A number of them were very badly damaged by the disease and all showed extensive cankers on the trunks and lower limbs. The cankers were carefully cut out, disinfected with

corrosive sublimate (1 in 1,000) and painted over. Lead paint, free from turpentine, was first used, but this was found to crack and check, and thus did not afford complete protection, so a second coating of coal-tar was given. The coal-tar was found to give better protection in not cracking or blistering, and no injurious effect has been noticed from its use. This cutting out of the cankers was supplemented by lime-sulphur sprayings for the control of Apple Scab. This summer an inspection of the treated trees was made. The results were very satisfactory. Nearly all the wounds were healing over nicely and all the trees, except three which were nearly dead when the experiment was begun, appeared to be recovering rapidly. More than this, no new cankers could be found on any of the trees in the orchard. It is, therefore, safe to state that if the orchard is properly sprayed with lime-sulphur for Apple Scab, the Black Rot can be controlled by carefully cutting out the cankers on the diseased trees, disinfecting with corrosive sublimate (1 in 1,000) and painting over the wounds with coal-tar.

Publications.

A revision of Bulletin 128, "Weeds of Ontario," has been made. Many new weeds have been added and the classification and nomenclature brought up to date. "Weeds of Ontario" is now issued as bulletin No. 188. Several short articles on weeds, weed seeds and plant diseases have been contributed to various agricultural publications.

Herbarium.

A considerable number of new species has been added, including a number of the rarer ferns presented by Mr. F. J. A. Morris of Port Hope. A large weed seed cabinet has been secured and the weed seed collection is being classified and made readily accessible for reference in identifying samples. The reference collection of Fleshy Fungi has been increased, re-arranged and listed by Mr. McCubbin. Lists of the new species added and of the Fleshy Fungi in the reference collection are appended:

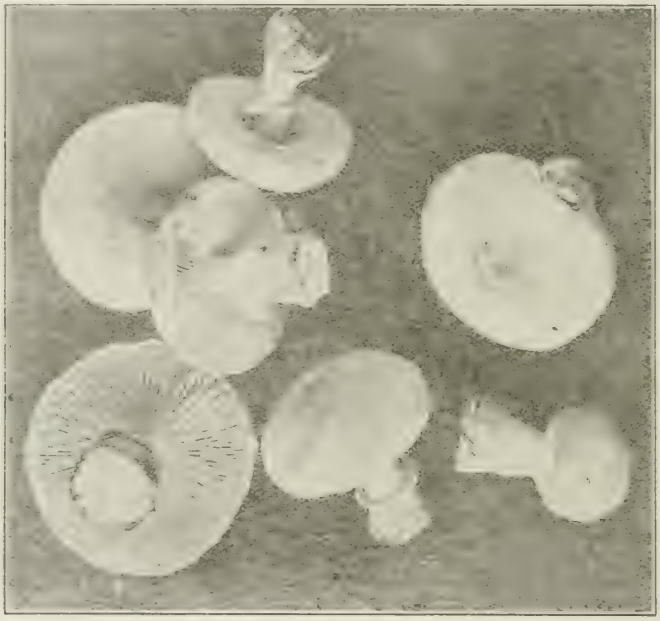
List of New Species added to Herbarium, 1910-1911.

Petalostemum candidum, Michx.
Eryngium yuccifolium (Michx.).
Acnida tuberculata (Moq.).
Oenothera laciniata (Hill).
Verbena bracteosa (Michx.).
Panicum virgatum (L.).
Diarrhena diandra (Michx.), Wood.
Eragrostis pilosa (L.), Beauv.
Rumex altissimus (Wood).
Oxybaphus nyctagineus (Michx.), Sweet.
Silene stellata (L.), Ait.
Baptisia leucantha (T. & G.).
Lepachys pinnata (Vent.), T. & G.
Botrychium ramosum (Roth.), Aschers.
Botrychium lanceolatum (Augs.).
Centaurea jacea (L.).
Coreopsis palmata (Nutt.).
Silphium laciniatum (L.).
Lycium halimifolium (Mill.).
Cacalia tuberosa (Nutt.).
Lippia lanceolata (Michx.).
Petalostemum purpureum (Vent.), Rybd.
Polygonum hartwrightii (Gray).
Phoradendron flavescens (Pursh), Nutt.
Gerardia purpurea (L.).
Senecio jacobea (L.).
Carduus crispis (L.).
Stellaria aquatica (L.), Scop.
Amorpha canescens (Pursh.).
Asplenium ebenoides, R. R. Scott.
Aspidium fragrans (Swartz).
Anthyllis vulneraria (L.).

List of Fleshy Fungi in Herbarium.

1. *Hypholoma appendiculatum*, Bull. Edible. In large quantities on flats of Speed, Sept. 4, 1911.
2. *Stropharia semiglobata*, Batsch. Edible, according to Hard. Flats of Speed, Sept. 4, 1911.
3. *Mycena haematopa*, Pers. Speed Flats under cedars, Sept. 4, 1911.
4. *Fomes igniarius*, Fr. On elm stump, Speed Flats, Sept. 4, 1911.
5. *Lepiota naucina*, Fr. Edible. Lawn O. A. C., plentiful all through September in neighborhood.

6. *Agaricus comtulus*, Fr. Edible. Only a few specimens. Cedar woods, Speed Valley, Sept. 7, 1911.
7. *Russula variata*, Bau. Edible, but not of good flavor (Hard.). Poplar woods near Riverside Park. Frequent but varying greatly in color. Sept. 9, 1911.
8. *Panis rudus*, Fr. Edible, but tough. Swampy woods near Riverside Park, Sept. 9, 1911.
9. *Naucoria semiorbicularis*, Bull. Edible. Poplar woods near Riverside Park, Guelph, Sept. 9, 1911.
10. *Omphalia campanella*, Batsch. Edible. Guelph, Sept., 1911.
11. *Lycoperdon gemmatum*, Batsch. Edible while young. Open woods on ground, Sept., 1911.
12. *Mycena epipterygia*, Scop. Poplar woods near Riverside Park, Guelph, Sept., 1911.
13. *Coprinus atramentarius*, Fr. Edible. Rich soil, poplar woods, Sept. 9, 1911.
14. *Schizophyllum alneum* (L.), Schroet. Dead basswood log, Speed Valley, Sept. 7, 1911.
15. *Lepiota procera* (Scop.), Pk. Edible. Under fir trees, O. A. C. grounds, Sept. 8, 1911.
16. *Clitocybe infundibuliformis*, Schaeff. Edible. Dry cedar woods, Set. 7, 1911.
17. *Dacromyces deliquescens*. Poplar woods near Riverside Park, Guelph, Sept. 9, 1911.
18. *Geaster triplex*, Jung. Speed Valley, Sept. 7, 1911.



An Edible Mushroom. (*Lepiota naucina*, Fr.)

19. *Tricholoma album*, Schaeff. Edible. Field near Guelph, Sept., 1911.
20. *Galera crispa*, Longyear. Speed Valley on ground in woods.
21. *Boletinus pictus*, Pk. Edible. Damp woods, Sleeman's Park, near Guelph, Sept. 13, 1911.
22. *Collybia velutipes*, Curtiss. Edible In tufts on elm stump, Sept. 16, 1911.
23. *Claudopus nidulans*, Pers. Edible but tough, and of disagreeable odor. Fallen logs in O. A. C. woods, Sept. 16, 1911.
24. *Tricholoma personatum*. Fr. Edible. Pine woods in clumps and crowded rows. O. A. C. woods, Sept. 16, 1911.
26. *Collybia radicata*, Rehl. Edible. Sept. 20, 1911.
27. *Inocybe subochracea*, Pk. (Not Burtii.) Edible. Sept. 20, 1911.
29. *Pleurotus sapidus*, Kalchb. Edible. Sept., 1911.
30. *Clavaria abietina*, Schum. Woods near Guelph, Sept. 22, 1911.
31. *Clitocybe candida*, Bres. Edible. In clusters in O. A. C. woods, Sept. 22, 1911.
32. *Lactarius torminosus* (Schaeff.). Fr. Poisonous to some extent, causing cramps. O. A. C. woods, Sept. 21, 1911.
33. *Boletus edulis*, Bull. Edible. Poplar swamp near O. A. C., Sept. 21, 1911.
34. *Armillaria mellea*, Vahl. Edible. Sept. 25, 1911.
35. *Boletus versipellis*, Fr. Edible. Sept. 28, 1911.
36. *Clitocybe phyllophila*, Fr. Sept. 30, 1911.
37. *Helvella elastica*, Bull. Edible. Speed Valley below Guelph, Oct. 30, 1911.

38. *Helvella lacunosa*, Af. Edible. Cherry swamp, Bolton, Ont., Aug. 30, 1911.
39. *Morchella esculenta*, var. *conica*, Pers. Edible. Whitby, Ont., June, 1911.
40. *Lachnea scutellata*, F. Home, Oct., 1911.
41. *Urnula craterium* (Schw.). Fr. Puslinch Lake.
42. *Hypoxylon*, sp. Woods near Guelph, Oct., 1911.
43. *Geoglossum nigritum*, Cooke. Cherry swamp, Bolton, Ont., Aug. 30, 1911.
44. *Coccomyces triangularis* (Schw.), Sacc. Ithaca, N.Y.
45. *Cordyceps langloisii*. Grenadier Pond, Toronto, July 22, 1911.
46. *Tricholoma rutilans*, Schaeff. Ithaca, N.Y.
47. *Cortinarius cinnamomeus* (L.), Fr. Ithaca, N.Y.
48. *Crepidotus fulvo-tomentosus*, Pk. Ithaca, N.Y.
49. *Collybia dryophila*, Bull. Ithaca, N.Y.
50. *Cantharellus floccusus*, Schw. Ithaca, N.Y.
51. *Boletus chrysenteron*, Fr. Ithaca, N.Y.
52. *Cortinarius*, sp. undet.
53. *Collybia lentinoides*. Ithaca, N.Y.
54. *Craterellus cornicopioides*, Fr. Cherry swamp, Bolton, Ont., Aug. 30, 1911.
55. *Hygrophorus conicus*, Fr. Cherry swamp, Bolton, Ont., Aug. 30, 1911.
56. *Amanita muscaria*, L. Cherry swamp, Bolton, Ont., Aug. 30, 1911.
57. *Lactarius vellereus*, Fr. Cherry swamp, Bolton, Ont., Aug. 30, 1911.
58. *Hygrophorus psittacinus*, Fr. Enfield Gorge, Ithaca, N.Y.
59. *Crepidotus versutus*, Pk. Decaying wood, Ithaca, N.Y.
60. *Galera tenua*, Schaeff. O. A. C. Campus.
61. *Pholiota praecox*. Ithaca, N.Y.
62. *Mycena leajana*, Berk. Ithaca, N.Y.
63. *Craterellus cantharellus* (Schw.), Fr. Cherry swamp, Bolton, Ont., Aug. 30, 1911.
64. *Cantharellus aurantiacus*. Edible. Cherry swamp, Bolton, Ont., Aug. 30, 1911.
65. *Naucoria semiorbicularis*, Bull. Edible. Ithaca, N.Y.
66. *Coprinus comatus*, Fr. Edible. O. A. C. Campus and other places, Sept., 1911.
67. *Clitocybe*, sp. undet. Speed Valley, Sept. 9, 1911.
68. *Favolus canadensis*, Klotsch. Ithaca, N.Y.
69. *Lenzites betulina*, Fr. Ithaca, N.Y.
70. *Stereum complicatum*. Ithaca, N.Y.
71. *Polystictus conchifer*. Elms, O. A. C. woods.
72. *Polystictus abietinus*. On hemlock, Coy Glen, Ithaca, N.Y.
73. *Irpiciporus lacteus* (Fr.), Murrill. On dead wood, Ithaca, N.Y.
74. *Stereum sericeum*, Schw. Ithaca, N.Y.
75. *Polystictus versicolor*, Fr. Ithaca, N.Y.
76. *Polyporus elegans*, Fries. Fallen birch, Bolton, Ont., July 30, 1911.
77. *Polyporus brumalis*, Pers. Fr. Sept., 1911, Toronto.
78. *Polystictus hirsutus*, Fr. Various trees, Ithaca, N.Y.
79. *Trametes rubescens*, Fr. Cherry swamp, Bolton, Ont., Aug. 30, 1911.
80. *Hydnum repandum*, L. Cherry swamp, Bolton, Ont., Aug. 30, 1911.
81. *Boletus Americanus*, Pk. Cherry swamp, Bolton, Ont., Aug. 30, 1911.
83. *Polyporus cinnabarinus*, Fr. Dead, deciduous trees, N. Y.
84. *Gaester minimus*. Ground near Puslinch Lake, June, 1909.
85. *Clavaria pistillaris*. Edible. Cherry swamp, Bolton, Ont., Aug. 30, 1911.
86. *Cyathus striatus*, Hoffm. Ithaca, N.Y.
87. *Calvatia giganteum*, Batsch. Edible. O. A. C. woods, Sept., 1911.
88. *Fomes megaloma*, Cooke. Victoria Park, May, 1908.

List of Myxomycetes in Herbarium.

Ophiotheca wrightii, Berk & Curtis.
Lycogala miniatum, Pers.
Stemonitis morgani, Pk. (From Bolton, Ont.)
Lycogala epidendrum, Buxb.
Leocarpus fragilis (Dicks.), Rost.
Stemonitis maxima, Schw.
Physarum sinuosa (Bull.), Champ.
Chondrioderma spumarioides, Rost.
Arcyria incarnata, Pers. (Lambton, Ont.).
Hemitrichia clavata (Pers.), Rost.
Dictydium cancellatum (Batsch.), Macbr. (Lambton, Ont.).
Trichia iowensis, Macbr.
Fuligo septica, Linn. (Gmel.).
Craterium leucocephalum (Pers.) Ditm. (From Toronto.)
Lamproderma violaceum (Fr.), Rost.
Arcyria denudata (Linn.), Shel.
Diderma reticulatum (Rost.), Morg. (From Toronto.)
Didymium farinaceum, Schrad.
Arcyria nutans (Bull.), Grev.
Four species unidentified.

Respectfully submitted,

J. E. HOWITT.

PART V.

THE PROFESSOR OF PHYSICS.

To the President of the Ontario Agricultural College.

SIR,—I have the honor to submit herewith my sixth report as head of the Department of Physics.

(*a*) LECTURE COURSES. In the first year the instruction in the Department consists of courses in Arithmetic, Hydrostatics as a preparation for and followed by Soil Physics, and lastly, a course in the principles of Mechanics. The work of the second year consists of Surveying, Drainage and Farm Power and Farm Water Supply by electricity, wind and water. The third year makes a specialty of Meteorology, Cold Storage, and Ventilation, based upon a through course in Heat. In the final year Climatology, Advanced Drainage, and Advanced Soil Physics are emphasized.

(*b*) LABORATORY WORK. Laboratory practice is given in all the years in the various subjects.

WEATHER REPORT.

Tables I. and II. give a summary of the weather data at representative stations which this Department has equipped with the necessary meteorological instruments.

TABLE I.—WEATHER REPORT FOR 1911.

Month.	Mean temperature.	Departure from normal.	Highest temperature.	Lowest temperature.	Snowfall.	Rainfall.	Precipitation in inches.	Departure from normal.
O.A.C. Guelph—		(24 yrs.)						(24 yrs.)
January	22.6	+3.3	42.0	—1.0	5.0	.70	1.20	— .74
February	21.3	+1.8	43.0	3.0	17.0	3.70	3.70	+2.01
March	28.0	+ .6	53.0	0.0	7.0	1.30	1.30	0.00
April	40.3	—2.0	74.0	12.0	.....	1.67	1.67	— .05
May	61.7	+7.6	90.0	24.0	.....	1.64	1.64	— .75
June	65.4	+1.7	88.0	43.0	.....	.89	.89	—1.82
July	71.0	+4.4	99.0	44.0	.....	1.95	1.95	—1.00
August	71.6	+5.0	89.0	41.0	.....	2.53	2.53	+ .33
September	59.7	+1.2	83.0	30.0	.....	3.42	3.42	+1.16
October	48.7	+1.7	67.0	30.0	.5	2.90	2.95	+ .64
November	43.4	+7.1	65.0	9.0	10.1	1.67	2.68	+ .41
December	30.3	+5.7	55.0	8.0	3.0	1.97	2.27	+ .57
Year	47.0	+3.1	99.0	—1.0	42.6	21.94	26.20	+ .72

TABLE I.—Weather Report for 1911.—Continued.

Month.	Mean temperature.	Departure from normal.	Highest temperature.	Lowest temperature.	Snowfall.	Rainfall.	Precipitation in inches.	Departure from normal.
Bay View—		(5 yrs.)						(5 yrs.)
January	18.0	—1.0	49.0	15.5	5.6	1.83	2.39	—1.27
February	21.7	+3.4	40.0	9.0	13.5	.42	1.77	— .37
March	19.8	—5.1	48.0	7.0	14.0	.74	2.14	— .08
April	34.7	— .7	74.0	9.0	2.0	.91	1.11	—1.54
May	51.8	—6.2	83.0	27.0	.....	.31	.31	—1.83
June	58.5	+1.8	79.0	39.0	.....	2.91	2.91	+ .50
July	68.0	+4.3	87.0	52.0	.....	.65	.65	—2.54
August	64.8	+1.8	87.0	45.0	.....	4.66	4.66	— .17
September	54.4	—1.8	73.0	36.0	.....	5.80	5.80	+2.10
October	43.1	—3.0	64.0	27.0	.....	1.20	1.20	+2.08
November	32.9	—3.6	58.0	13.0	10.5	3.32	4.37	+ .20
December	28.6	+3.3	53.0	7.0	4.9	1.90	2.39	—1.53
Year	41.4	+ .6	87.0	7.0	50.5	24.65	29.69	—8.61
Camlachie—								
August	65.7	.....	93.0	41.5	.....	.85	.85	.....
September	57.7	.....	87.0	29.5	.....	2.17	2.17	.....
October	45.4	.....	69.0	19.0	.....	2.86	2.86	.....
November	.....	.....	.....	.....	.....	.....	.....	.....
December	32.7	.....	58.0	7.0	.....	.....	.....	.....
Cairo—								
July	71.6	.....	103.0	.....	.....	2.03	2.03	.....
August	68.0	.....	94.0	.....	.....	2.11	2.11	.....
September	.....	.....	.....	.....	.....	.....	.....	.....
October	.....	.....	.....	.....	.....	.....	.....	.....
November	.....	.....	.....	.....	.....	.....	.....	.....
December	31.5	.....	56.0	.....	.....	1.15	1.15	.....
Forest—								
July	71.3	.....	101.0	50.0	.....	1.22	1.22	.....
August	61.7	.....	91.0	40.0	.....	2.95	2.95	.....
September	60.4	.....	88.0	35.0	.....	3.60	3.60	.....
October	47.6	.....	68.0	28.0	.....	3.73	3.73	.....
November	35.1	.....	65.0	1.0	.....	3.14	3.14	.....
December	32.4	.....	58.0	14.0	1.0	1.39	1.49	.....
Grimsby—		(2 yrs.)						(2 yrs.)
January	26.5	+ .6	47.0	—3.0	12.0	1.34	2.54	.....
February	26.4	+1.0	48.0	3.0	38.9	.39	4.28	.....
March	31.1	—4.4	59.0	4.0	1.7	1.57	1.77	.....
April	43.2	—1.4	76.0	16.0	.....	1.77	1.77	— .98
May	61.2	+4.5	97.0	29.0	.....	1.12	1.12	— .84
June	64.9	+ .3	91.0	45.0	.....	3.67	3.67	+1.18

TABLE I.—WEATHER REPORT OF 1911.—Continued.

Month.	Mean temperature.	Departure from normal.	Highest temperature.	Lowest Temperature.	Snowfall.	Rainfall.	Precipitation in inches.	Departure from normal.
Jordan Harbor—		(4 yrs.)						(4 yrs.)
January	27.5	+ .4	48.0	1.0	.....	2.57	2.57	+ .24
February	27.5	+2.9	47.0	9.0	.....	0.00	0.00	—1.00
March	.....	.....	.....	7.0	.....	.51	.51	— .42
April	.....	.....	.....	20.0	.....	.56	.56	—1.58
May	.....	.....	.....	30.0	.....	1.97	1.97	— .42
June	63.6	— .5	90.0	45.0	.....	2.43	2.43	+ .6
July	67.3	—1.6	103.0	50.0	.....	2.86	2.86	— .56
August	66.4	—1.1	88.0	47.0	.....	5.25	5.25	+2.41
September	61.2	— .7	87.0	36.0	.....	2.01	2.01	+ .10
October	51.5	+4.7	75.0	29.0	.....	3.91	3.91	+ .90
November	36.7	—1.8	64.0	17.0	.....	.75	.75	— .78
December	34.7	+6.1	62.0	17.0	.....	1.41	1.41	+ .16
Year	.....	.....	.....	.....	.....	.....	.....	.....
Leamington—		(5 years)						(5 years)
April	50.3	+6.1	74.0	25.0	.....	2.92	2.92	+ .88
May	63.8	+9.1	97.0	29.0	.....	1.22	1.22	— .57
June	68.5	+2.5	93.0	40.0	.....	4.58	4.58	+ .93
July	73.0	+ .8	97.5	46.0	.....	1.77	1.77	+ .23
August	70.6	+ .6	92.0	45.0	.....	2.96	2.96	+ .14
September	63.2	+1.0	85.0	36.0	.....	5.47	5.47	+2.56
October	50.6	+ .4	75.0	24.0	.....	4.14	4.14	+1.70
November	35.2	—2.4	60.0	13.0	1.75	3.91	4.08	+1.39
December	33.1	+4.7	51.0	10.0	1.75	3.03	3.20	+1.63
Magnetawan—		(6 years)						(6 years)
January	10.7	—3.2	41.0	26.0	11.6	.53	1.69	— .97
February	14.5	+3.9	44.0	18.5	11.5	.55	1.70	— .60
March	20.3	—1.3	54.0	20.0	23.6	.67	3.03	+ .69
April	36.0	— .6	75.0	2.0	4.5	1.27	1.72	— .93
May	56.4	+7.6	85.5	18.5	1.0	3.20	3.30	+ .47
June	60.2	0.0	82.0	39.0	.....	1.92	1.92	— .44
July	66.4	+1.8	93.0	42.0	.....	1.25	1.25	— .72
August	64.1	+1.3	87.0	32.0	.....	2.24	2.24	—1.59
September	54.3	—1.5	79.0	21.0	.....	1.77	1.77	—1.19
October	42.3	— .9	68.0	20.0	1.8	4.22	4.40	+ .88
November	27.1	—3.4	60.0	6.0	22.5	3.42	5.67	+2.45
December	24.7	+8.5	53.0	8.0	12.2	.65	1.87	— .49
Year	39.8	+1.0	93.0	2.0	88.7	21.69	30.56	—2.43

TABLE I.—Weather Report of 1911.—Continued.

Month.	Mean temperature.	Departure from normal.	Highest temperature.	Lowest temperature.	Snowfall.	Rainfall.	Precipitation in inches.	Departure from normal.
Maitland—		(6 years)						(6 years)
January	14.6	—5.4	42.0	15.0	7.75	.68	1.45	—1.19
February	14.5	+1.4	42.0	24.0	8.00	.50	1.30	0.00
March	23.2	—2.6	50.0	12.0	7.50	.41	1.16	— .47
April	40.5	+1.0	77.0	5.0	.....	1.34	1.34	— .53
May	61.3	+8.2	88.0	29.0	.....	1.89	1.89	—1.23
June	63.3	+ .6	83.0	44.0	.....	1.34	1.34	—1.06
July	68.8	+ .6	94.0	44.0	.....	1.89	1.89	— .39
August	68.8	+1.2	92.0	41.0	.....	3.86	3.86	+1.98
September	57.1	—3.3	79.0	29.0	.....	.....	.....	.....
October	.....	.....	.....	.....	.....	.....	.....	.....
November	.....	.....	.....	.....	.....	.....	.....	.....
December	29.4	+8.3	57.0	0.0	2.5	.37	2.62	+ .61
Year	.....	.....	.....	.....	.....	.....	.....	.....
Marksville—		(6 years)						6 years)
January	10.0	—8.0	38.0	23.0	14.0	.....	1.40	— .21
February	15.8	—1.1	45.0	23.0	10.0	.....	1.00	—1.00
March	22.0	—2.2	48.0	9.0	4.0	.....	.40	—1.21
April	39.8	+2.8	76.0	2.0	.....	.10	.10	—2.27
May	58.5	+9.2	84.0	20.0	.....	5.58	5.58	+1.64
June	61.2	0.0	97.0	43.0	.....	2.45	2.45	— .13
July	64.8	— .1	97.0	41.0	.....	2.10	2.10	— .92
August	63.5	+ .4	84.0	38.0	.....	3.70	3.70	+ .22
September	56.6	—1.3	79.0	28.0	.....	2.30	2.30	—1.40
October	45.7	+1.2	70.0	25.0	.....	4.35	4.35	+1.42
November	25.8	—10.3	54.0	0.0	20.0	2.55	4.55	+1.81
December	27.7	+7.0	52.2	0.0	16.0	6.25	4.85	+2.15
Year	41.0	— .1	97.0	0.0	64.0	26.38	32.78	— .12
Monteith—		(2 years)						(2 years)
January	12.6	.....	32.0	40.0	27.50	.....	2.75	.....
February	10.5	.....	40.0	32.0	21.50	.....	2.15	.....
March	15.4	.....	48.0	30.0	7.50	.....	.75	.....
April	29.4	.....	72.0	14.0	5.00	.35	.85	.....
May	54.8	.....	90.0	22.0	3.00	.....	.31	.....
June	64.3	.....	90.0	38.0	.....	3.24	3.24	.....
July	69.0	+5.5	101.0	46.0	.....	2.80	2.80	—1.36
August	65.3	+3.5	85.0	40.0	.....	2.07	2.07	— .71
September	49.1	— .8	77.0	24.0	1.50	2.11	2.26	— .58
October	39.9	—1.2	70.0	12.0	2.25	1.58	1.80	—1.75
November	19.1	—3.4	48.0	11.0	24.00	1.41	3.81	+ .66
December	17.9	+5.7	43.0	25.0	4.00	4.37	4.77	+ .69
Year	37.3	.....	101.0	11.0	96.25	17.93	27.56	.....

TABLE I.—Weather Report of 1911.—Continued.

Month.	Mean temperature.	Departure from normal.	Highest temperature.	Lowest temperature.	Snowfall.	Rainfall.	Precipitation in inches.	Departure from normal.
Sturgeon Lake—		(4 years)						(4 years)
January	17.3	— .9	39.0	16.0	.....	.....	.....	.....
February	17.6	— .1	41.0	6.0	.....	.....	.....	.....
March	24.9	—3.0	49.0	6.0	.42	.....	.04	— .42
April	40.1	0.0	79.0	6.0	.....	.....	.....	.....
May	60.7	+6.8	90.0	21.0	.....	2.16	2.16	— .39
June	62.6	—1.3	84.0	33.0	.....	.19	.19	—1.14
July	70.3	+1.5	100.0	42.0	.....	5.18	5.18	+1.43
August	74.5	-6.7	88.0	41.0	.....	1.51	1.51	—1.03
September	60.2	+1.3	80.0	38.0	.....	3.40	3.40	+ .85
October	47.2	— .4	67.0	26.0	.....	5.16	5.16	+2.15
November	31.5	—1.2	59.0	6.0	5.0	1.15	1.65	— .03
December	29.8	+9.8	49.0	12.0	0.0	.45	.45	— .68
Year	44.7	+1.5	100.0	6.0	.....	.....	.....	.....
Walkerton—		(4 years)						(4 years)
January	24.0	.....	41.0	0.0	.....	.92	.92	.....
February	21.7	.....	45.0	1.0	.....	.11	.11	.....
March	27.2	—2.8	52.0	5.0	.....	1.82	1.82	.....
April	41.3	—7.8	75.0	1.0	.....	2.11	2.11	— .70
May	60.5	+5.0	89.0	24.0	.....	3.37	3.37	+ .65
June	63.9	+ .4	88.0	40.0	.....	1.78	1.78	— .69
July	69.8	+ .4	96.0	45.0	.....	3.77	3.77	+1.14
August	67.0	+1.2	88.0	36.0	.....	4.75	4.75	+1.44
September	54.5	—4.0	83.0	29.0	.....	4.73	4.73	+1.75
October	46.4	—1.4	68.0	28.0	.....	5.90	5.90	+2.74
November	31.1	—1.9	60.0	14.0	.....	3.08	3.08	— .04
December	29.3	—2.6	54.0	1.5	.....	.63	.63	— .01
Year	44.7	.....	96.0	0.0	.....	32.97	.....	.....
Wyoming—		(1 year)						(1 year)
August	64.6	.....	90.0	43.0	.....	1.53	1.53	.....
September	59.9	.....	90.0	38.0	.....	3.99	3.99	.....
October	47.3	.....	68.0	28.0	.....	4.58	4.58	.....
November	.....	.....	.....	.....	.....	.....	.....	.....
December	.....	.....	.....	.....	.....	.....	.....	.....

TABLE. II.—LENGTH OF SEASONS AT VARIOUS STATIONS, 1911.

Stations.	Last killing frost in spring.		First killing frost in autumn.		No. of days between first and last frosts.	Average length of season free from killing frosts.
	Date.	Degree.	Date.	Degree.		
Guelph	May 4	28	Sept. 14	30	133	148 (24 years.)
Bay View	May 17	28	Oct. 28	29	164	154 (5 years.)
Camlachie			Sept. 14	29.5		
Cairo						
Int. Farms, Forest			Sept. 14	30.0		
Lakeside, Farms. Forest			Nov. 2	28.0		
Grimsby	May 3	29				
Jordan Harbor			Oct. 28	29.0		
Leamington	May 3	29	Oct. 27	28.0	177	157 (4 years.)
Magnetawan	May 14	27	Sept. 13	26.0	122	128 (6 years.)
Maitland	May 4	29	Sept. 28	29.0	147	144 (6 years.)
Marksville	May 4	25	Sept. 28	28.0	147	134 (6 years.)
Monteith	May 3	28	Sept. 7	29.0	127	
Sturgeon Lake	May 4	27	Oct. 27	28.0	176	159 (3 years.)
Walkerton	May 3	24	Oct. 8	30.0	158	148 (4 years.)
Wyoming			Oct. 28	24.0		

TABLE III.—WIND RECORD AT GUELPH, 1911.

Month.	Miles of wind.	No. of days on which records were kept.	Average miles of wind per day.	Average miles of wind per hour.	Windiest day.				Calmest day.			
					Total No. of miles.	Miles per hour.	Miles on windiest hour.	Least windy hour.	Total No. of Miles.	Miles per hour.	Windiest hour.	Calmest hour.
January	9,578	30.9	309.9	12.9	640	26.6	39	15	84	3.5	6	0
February	9,343	26.2	356.6	15.1	575	23.9	31	15	183	7.6	15	1
March	9,931	30.1	329.9	13.7	592	24.7	35	16	169	7.0	11	2
April	8,151	29.1	276.2	11.5	540	22.5	32	8	79	3.3	12	0
May	7,744	29.2	265.6	11.0	477	19.9	31	8	141	5.9	11	0
June	6,358	30.0	211.9	8.8	377	15.7	24	6	81	3.4	8	0
July	6,413	31.0	206.9	8.6	541	22.5	33	10	37	1.5	7	0
August	5,540	31.0	178.7	7.4	361	15.0	25	6	78	3.3	9	0
September	5,861	29.1	201.4	8.4	342	14.2	20	10	71	2.9	7	0
October	7,442	30.9	240.8	10.0	680	24.1	36	6	82	3.4	8	0
November	10,914	30.0	363.8	15.1	748	31.2	39	24	107	4.4	11	0
December	9,357	30.2	309.8	12.9	769	32.0	40	11	114	4.8	12	0
Year	96,632	357.7	270.1	11.3	769	32.0	40	11	37	1.5	7	0

Drainage Surveying.

During 1911 the Drainage Campaign has been continued. Table IV. presents a summary of the work done since the campaign was inaugurated.

Table IV.—Summary of Survey Work of the Department of Physics.

Year.	Applications.	Surveys.	Applications held over.	Acres surveyed.	Miles of drain.	Demonstrations.	
						No.	Attendance (Average).
1906	15	15	.....	500	45	.....	.....
1907	126	70	56	3,500	350	.....	.....
1908	166	100	66	5,000	510	43	.....
1909	302	179	121	5,157	613	48	18.
1910	518	383	135	14,672	1,800	132	23.6
1911	414	327	87	15,211	1,864	142	17.4
Totals	.....	1,074	.....	44,040	5,182	365	.....

The drainage appropriation for 1911 was the same as for 1910. It will be observed that the acreage surveyed was slightly in excess of that for last year, although the number of surveys was somewhat less. This is a hopeful sign as it indicates that farmers are draining in larger blocks from year to year. The suddenness of the changes in the season made the farmers extremely busy, and hence the attendance at demonstrations dropped off somewhat compared with last year.

Increase in Drainage.

The statistics of number of tile manufactured in Ontario for 1911 are not yet available, but assuming that the number equalled that for 1910, (the number has been increasing rapidly since 1905-6), then the total increase in drainage from 1906-1910 inclusive, amounts to 131,000 acres. According to reports received from farmers who have drained, the increase in crops due to drainage is worth over $20 per acre per year. At this rate the value of the increased crops due to *increase* in drainage would be $20 × 131,000 = $2,620,000 annually. As from year to year the increase in drainage continues these figures must be largely increased each year.

Drainage Staff.

Besides the permanent members of the staff, consisting of the writer, Mr. R. R. Graham, and Mr. J. R. Spry, the following were engaged during the whole or part of the summer: Messrs Bergey, Clemens, Rettie, Tipper of the present Fourth Year, and Messrs. Hood, Hunter, Kay, Miller, Nixon, Reid, Shaver, Vining and Woltz of the incoming Third Year. An extra stenographer was also engaged. Of these Mr. R. M. Tipper acted as supervisor for most of the summer, laying out routes, setting dates of demonstrations, and getting out advertising for the same.

Does Education Pay?

The total appropriation for the Drainage Campaign has been $10,000. The return in the pockets of the farmers, we believe, is over two and a half million dollars this year. Should not the campaign be extended?

Education spreads. While we have surveyed only 43,730 acres, yet the increase in drainage has been 131,000 acres. This refers to Ontario alone; but other provinces, e.g. Nova Scotia and Quebec, have instituted drainage campaigns modelled after that of Ontario. Moreover several States of the American Union have followed our lead in this matter.

Needs of the Campaign.

There are large sections of Ontario where little progress has been made in drainage—*e.g.*, in Haldimand County, where it is claimed that "drains will not work"—and I think it advisable to go into these districts, and besides laying out the plan of drains, superintend the construction of drains in a demonstration plot here and there. Besides, we have never yet been able to keep abreast of the applications for surveys. In view of the vastness of the drainage problem, of the advisability of demonstration plots, of the great returns from the money spent in this work, and of the urgency of applications for assistance from many whom we have been unable to aid, it is respectfully submitted that the appropriation for this work should be largely increased—$10,000 would not be too much for the needs of 1912.

Canada's Drainage Problem.

For Ontario—and Canada,—perhaps no single line of development presents such stupendous possibilities as that of drainage. Of the tilled land in old Ontario fully one-third, or five million acres, requires tile drainage. And there are five million acres of slash, swamp, and marsh in old Ontario that can be reclaimed by drainage, making ten million altogether. But Ontario's problem does not end here. In New Ontario lies a tract of sixteen million acres of clay land, practically every acre of which will need tiling in order to secure good results. To permit of this, large outlets must be provided by the Government as was done in the County of Essex years ago. Up to that time large tracts of Essex could not be settled. What outlets and tile drainage have meant to Essex they will mean to New Ontario—and more, for the north has a drawback that the south has not, viz., an extremely short season. Drainage will lengthen that season. Why? Because water is six or seven times as hard to heat as dry soil, and consequently saturated soil is two or three times as hard to heat as soil from which the surplus water has drained away. Consequently, if drainage is provided so that this surplus is carried away, two or three weeks earlier in spring than would otherwise be the case, it follows that the soil must warm up earlier in the season, and therefore, that late spring frosts are prevented to that extent—thus minimising New Ontario's greatest deficiency.

Thus we see that in Ontario alone—Old and New—there is at least twenty-five to thirty million acres of land to be drained, much of which is entirely useless until drained, and the remainder only partially productive. When this drainage is completed, as it will be some day, the value of Ontario's farm products will be counted in *billions* of dollars, instead of *millions* as to-day.

And what drainage means to Ontario, it will mean to every Province in the Dominion, with the possible exception of Alberta. Ontario has from twenty-five to thirty inches of rainfall in the year, and as we go eastward the precipitation increases, till in Nova Scotia and Prince Edward Island it amounts to from forty to fifty inches. Hence Quebec and the Maritime Provinces, with greater rainfall than Ontario, and similar topography, have greater need of drainage than Ontario

Manitoba and Saskatchewan, while having slightly less precipitation than Ontario, are on the whole much flatter, so that with them also, drainage is destined to become a great problem. The valleys of British Columbia, with its immense quantities of rain during the "rainy season," will also require drainage. In Alberta, precipitation being deficient, irrigation is necessary, but if the experience of the arid states is repeated, it will be found that in Alberta drainage will yet be required to supplement the irrigation.

The total area in Canada that will need drainage, it is impossible to state with any degree of accuracy, but it is safe to say that if all wet parts were drained the increase in value of crop returns would amount to several *billions* of dollars annually.

Investigations.

For several years the urgency of the Drainage Campaign, and the limited funds at our disposal for that work have made it almost imperative that the permanent staff of the Department devote its time to survey work, at the sacrifice of investigation work. Owing to the increased appropriations we have this year begun some investigations which give promise of important results.

Deep vs. Shallow Drainage.

The depth at which tile should be placed for best drainage is a mooted point. Some time ago, we had some galvanized iron cans made which are so constructed that the soil in them may be drained at different depths. The illustration shows five of these, each with a tobacco plant growing in it.

The figure on each can gives the depth in feet to which the soil was drained. All plants were set in the cans at the same time, the cans sat side by side during the growth of the plants, and water was added from day to day to keep the water table at the depth set for each can. The deepest drainage gave the largest plant. We are now performing the same test with grains, corn, etc.

We have also commenced comprehensive investigation of the effect of drainage on soil properties—porosity, water-holding capacity, temperature, etc.

All of which is respectifully submitted.

WM. H. DAY.

PART VI.

PROFESSOR OF CHEMISTRY.

To the President of the Ontario Agricultural College:

SIR,—I have the honour to present the following report of the Department of Chemistry.

As usual a very large part of my time, and of those associated with me in the work of the department, has been given to class work. The course of instruction laid down in the College Calendar has been faithfully carried out, and, as no changes have been made this year, it is not necessary to repeat the details here. I may state, however, that owing to the increased number of students in attendance, the teaching takes up a greater proportion of our time than formerly. This is especially true of the laboratory instruction, as larger classes render preparation of more materials necessary, and a greater number of assistants are required to give the individual instruction which laboratory work demands.

In addition to the instruction of the regular courses, we have given the usual lectures and practical work to the students of the short courses.

Outside of the laboratory the work of the department is continually widening; not only are farmers, fruit growers, etc., appealing to us for information, but manufacturers of agricultural products are more and more looking to us for information and assistance in their work. This is particularly true of the manufacturers of insecticides and fungicides, fertilizers, animal foods, and wheat flour. By correspondence, articles for agricultural and technical papers, bulletins, and by addresing meetings of various kinds, we seek to spread the information we are gathering from our investigation work.

LABORATORY WORK.

During the summer a special study was made of the protein and carbohydrates of wheat and flour with the object of determining the relationship of these to the baking strength of flour. The problem is a very difficult one and no definite results have been obtained as yet. We also spent considerable time on Insecticides and Fungicides, particularly lead arsenate and lime-sulphur wash; on the analysis of rural well waters, fertilizer experiments, and in collection and examination of soils of the Simcoe County blow-sand district.

During the summer our geological specimens were all rearranged and relabelled so that they may be more useful to the students in their study of the minerals.

The work done in our flour testing laboratory is apparently giving satisfaction: for each year a greater number of millers and bakers are sending us samples of wheat and flour for testing purposes. That this line of work is appealing to the millers is further evidenced by the fact that more of our larger milling companies are putting in flour testing departments in connection with their mills, and also by the fact that during the year we have had four students take special instruction with us to qualify for this interesting line of work.

In addition to the analysis made in connection with the investigation work indicated above, we have received for examination a large number of samples of soil, water, feeds, cases of suspected poisoning, etc., etc. Some of the analytical work asked for we could not see our way to undertake, and the correspondents were referred to commercial chemists in Toronto, Hamilton and Montreal. Other samples were of such a nature that we did not require to analyze to give the required information. There were, however, two hundred and two samples of materials received from correspondents that were analyzed more or less fully and reports made thereon. These samples may be classified as follows: Soils, 30; Fertilizer, 15; Cattle Feeds, 17; Dairy Products, 44; Water, 34; Insecticides and Fungicides, 13; Miscellaneous, 49.

The samples marked as miscellaneous were made up of grains examined for cases of suspected poisoning, marl, bog iron ore, tri-sodium phosphates, ammonia liquor from gas works, etc., etc.

Soils.

We have not been able to take up an extended study of the composition of soils of any particular part of the country. Of the 30 samples analyzed during the year, some consisted of a partial analysis, but most of them were, for various reasons, fully analyzed, and we hope that the results obtained will be useful in various ways. However, I do not think that there would be any good purpose served by incorporating the composition of these here at this time.

Early in September we collected a number of samples from the light sandy soils of Norfolk County. These soils are particularly interesting because of the rapid advancement which is being made in fruit growing, particularly apple growing, in that part of the country. We hope to be able to analyze these samples some time during this winter.

This is the nature of work which we would like to extend as we find opportunity.

Fertilizers.

There is a strong and growing demand on the part of farmers, market gardeners, and fruit growers, for more definite information concerning artificial fertilizers. In many cases our correspondents are evidently very ignorant of the nature of these materials and the uses to which they should be put, and if let alone would almost surely waste a good deal of money in the application of these substances, which are expensive.

We are frequently asked to analyze a small sample of soil which is submitted to us and to state what plant food constituents are lacking, and what kind of crops will do best on such a soil. Unfortunately, the analysis of a sample from any particular district will not give us this information. We would need to make an extended study of the soils of the district before we could give all the information which is desired. In order that the farmer or fruit grower may become more familiar with the nature of the materials which form the active constituents of fertilizers, and at the same time gather information regarding the deficiency, if there be such, of plant food constituents in his soil, we recommend him to carry out a fertilizer experiment as follows:

Plot I. No fertilizer.
" II. Nitrate of soda, 200 lbs. per acre,
Muriate of potash, 200 lbs. per acre,
Superphosphate, 400 lbs. per acre.
" III. Nitrate of soda, 200 lbs. per acre,
Muriate of potash, 200 lbs. per acre.
" IV. Nitrate of soda, 200 lbs. per acre,
Superphosphate, 400 lbs. per acre.
" V. Muriate of potash, 200 lbs. per acre,
Superphosphate, 400 lbs. per acre.

The size of the plots used in this experiment may be made to suit the convenience of the experimenter. In grains, if he wishes to carry out experiments with such, he may have a very small plot, say one rod by two rods, which will very much lessen the work of the threshing of the grain from the various plots. With potatoes, corn, mangels, the plot should be very much larger. It would be better if all plots could be at least one-tenth on an acre in size. Muriate of potash and the superphosphate may be put on when the ground is being prepared, previous to seeding. About half the nitrate of soda may be worked into the soil at time of seeding. The balance may be put on some three weeks later. In the case of roots, just after thinning.

Such an experiment as outlined here when carefully conducted will give the farmer more information about the deficiencies of his soil than will an isolated chemical analysis of the soil, and at the same time he is becoming familiar with the active plant food constituents, which is a valuable point if he is to be successful in the use of these materials.

Last spring we started experiments somewhat similar to these in three peach orchards and in five apple orchards in various parts of the country. These we want to continue year after year until we see what results the application has upon the crop. Naturally, we can have no report for this year.

Cattle Feeds.

Apparently many farmers are still not familiar with the conditions of the Commercial Feeding Stuffs' Act, for samples of feeds are still sent to us for analysis. If the terms of the Act are being fulfilled, they should find the composition stamped on the bag, and, if they have reason to suspect that the guarantee is not correct, the Inland Revenue Department will analyze the material for a nominal fee. Perhaps it will not be out of place to again quote some of the most important sections of the Act. The Act defines a feeding stuff as follows:—

"Commercial feeding stuff," "feeding stuff," and "feed" may mean any article offered for sale for the feeding of domestic animals, and feeds claimed to possess medicinal as well as nutritive properties, excepting only hay and straw, roots, the whole seeds or the mixed or unmixed meals made directly from the entire grains of wheat, rye, barley, oats, Indian corn, buckwheat or flax seed: wet brewers' grain; the bran or middlings from either wheat, rye, oats, peas or buckwheat sold separately and not mixed with other substances."

This Act also provides that no commercial feeding stuff may be legally offered for sale in the Dominion of Canada until it is registered with the Inland Revenue Department. It is then given a registration number, which, together with the guaranteed per cent. of protein, fat and fibre, must be affixed by the

manufacturer or agent, to every package of commercial feeding stuff sold or offered for sale. The statement required is as follows:

1. Name of Brand .....
2. Registration number .....
3. Name and address of manufacturer .....
4. Guaranteed analysis .....

This may either be printed on the sack, or a printed tag bearing the required information may be attached to the package; and, further, any purchaser may have an analysis made by the Department of Inland Revenue, on payment of one dollar. Samples must be taken in conformity with the regulations. For regulations address the Deputy Minister of Inland Revenue, Ottawa.

We believe that the farmer should have his attention called to the Act, and, further, that it will be better for him to have the analysis made by the Inland Revenue Department, for it falls to them to enforce the Act. Consequently, we have made a practice of sending him a copy of the Act and advising him to communicate with the Inland Revenue Department. Most of the analyses of cattle foods made during the year have been made at the request of our own department of Animal Husbandry, and are given here because they may be of interest in connection with their feeding experiments.

COMPOSITION OF VARIOUS KINDS OF CATTLE FEEDS ANALYSED.

Serial No.	Name of Feed.	Moisture.	Crude Protein.	Crude Fat.	Crude Fibre.	Soluble Carbohydrates.	Ash.
		%	%	%	%	%	%
471	Soy Bean, coarse	8.98	41.5	2.17	7.87	33.71	5.77
474	Soy Bean, fine	10.41	41.07	2.15	12.32	28.55	5.50
473	Cotton Seed Meal	7.04	35.5	10.61	14.81	26.04	6.00
611	Cotton Seed Meal	8.9	38.2	8.	13.4	25.5	6.00
472	Dried Brewers' Grains	7.61	20.3	6.12	18.80	43.67	3.50
571	Shorts	.....	15.4	5.2	6.2	.....	.....
580	Middlings	9.34	14.02	5.18	7.8	59.56	4.1
582	Middlings	10.92	13.0	5.12	7.1	60.05	3.81
579	Red Dog Pig Feed	8.5	12.8	4.7	2.65	68.85	2.5
581	Red Dog Pig Feed	10.74	11.2	2.86	2.1	71.6	1.5
583	Linseed Cake	.....	.....	7.02	.....	.....	.....
610	Pea Meal	11.5	15.5	2.5	5.7	62.4	2.4
568	Pomace, thick pieces	34.8	4.	3.5	10.6	40.6	6.5
569	Pomace, thin pieces	25.4	3.4	4.5	14.7	50.9	1.1
526	Ensilage, No. 1	9.78	6.60	3.26	19.68	56.31	4.37
527	Ensilage, No. 2	11.24	6.96	3.00	22.22	52.43	4.15

The Soy Bean meal is a comparatively new feed in this country, and it is interesting to note that it contains a very high percentage of crude protein, in fact if we except Cotton Seed meal we have no other food that is comparable with it in this respect. The two samples of cotton seed meal reported are much lower in protein than many that we have analysed previously, and it seems from this analysis, and also from information that we have concerning other samples, that there is a tendency to bring into this country lower grade materials than formerly, and buyers will have to be on the watch that they do not purchase these inferior grades when they are expecting the higher grades.

The pomace material was simply apple pomace mixed with a certain amount of crude molasses. This analysis was made at the request of Mr. Menier, of the Horticultural Experiment Station, Jordan Harbour, and was with a view to ascer-

taining whether materials of this kind contained any high food value, or not. The analysis shows that they would have to be classified with the roughage and could not be considered a concentrate in any way.

The two samples of ensilage were made from corn grown in the same field, but No. 2 was cut three weeks later than No. 1. The chief point of difference in the composition is that evidently the crude fibre increased and the soluble carbohydrates decreased. This is as might be expected. The proteids have also increased somewhat, but the difference in any case is not very marked. The whole ensilage question is one worthy of study, for possibly some of the great differences in quality of the silage are due to improper fermentation, in some cases, at least, induced by too immature corn.

Well Water.

Whether it is due to more sickness traceable to well water, or to a wider spread knowledge of the dangers of impure water, it is not plain; but, it is certain that each year we are called upon to examine a greater number of samples of domestic waters. This is as perhaps might be expected, for as the country becomes more fully settled and the age of the existing wells increases, there is greater danger of contamination. In too many cases the wells do not receive the attention they should. For convenience sake they have been placed near the house or barn, and, while these wells may tap a pure supply of water, the soakage from surface pollutions, outhouses, and barns may so contaminate the water that it is unfit for domestic purposes. The soil is a good filter and it will, for a time, remove undesirable matters from the water before it passes into the well, but there is a limit to its powers of purification, and, if the source of contamination is too close, the water must in time become polluted. But, bad as this form of pollution may be, it is seldom as serious as that which takes place from the top. In some cases the well is so placed that heavy rains wash surface impurities directly into the well, or, what is still worse, the covering may not be tight and the water splashed from the pump, or rains, washes the dirt carried by chickens, or on the feet of those using the pump, into the well. Such pollution is not filtered and may be loaded with disease germs. Thus it is that the worst form of contamination is one that can easily be prevented by simply providing a tight cover for the well.

This latter source of pollution does not exist in properly arranged drilled wells. But, unfortunately, in many instances the mistake has been made of drilling in the bottom of the old well, and, while the pipe may be brought to the surface, thus bringing the pump in direct contact with the new supply of water, no care has been taken to prevent the water from the old well, which may carry its full charge of soakage materials, making its way down the outside of the pipe to the supply below. It is always better to make a fresh opening for the new well. Furthermore, all wells should be cemented down at least six or eight feet to prevent soakage water from getting in and they must have a tight top if the best results are to be obtained. There is little use drilling down into the rock for pure water if the supply is allowed to become contaminated from above.

The chemical analysis of a water is a comparatively simple matter, but it is very hard to make a proper interpretation of the results without a full sanitary report of the conditions surrounding the well, and even then we cannot say that the water is absolutely dangerous without a bacteriological examination to prove the presence of disease germs. But the results of the chemical analysis, together with the sanitary report, are quite sufficient to show whether the water is contaminated with undesirable materials or not.

During the past year we have received a number of samples of water for analysis. Thirty-four of these were analyzed and as full a report as possible made, but in many instances the information given to us regarding the conditions surrounding the well were not as complete as we would like to have had, or as full as we should have to make a safe statement of the condition of the water. In the future, we intend furnishing, not only directions for the taking of the sample, but also a list of questions to be answered regarding surroundings. Without this it is really useless for us to make the analysis. The results obtained from the thirty-four samples are given in the following table. Some of the data obtained show that the waters were so bad that we required no other information to condemn them, but in other doubtful cases a knowledge of the surroundings is necessary to a clear interpretation of the results.

MISCELLANEOUS SAMPLES OF WATER ANALYSED IN 1911.

Water.	Total Solids.	Chlorine.	Free Ammonia.	Albuminoid Ammonia.
	Parts per million.	Parts per million.	Parts per million.	Parts per million.
No. 1	238	14.	.04	.18
2	276	12.	.08	.16
3	527	36.6	.18	.06
4	760	12.	.05	.13
5	397	6.	.02	.18
6	750	.25	.18	.12
7	1.064	124.	3.6	.088
8	1,394	61.	.07	.16
9	326	8.	.88	.46
10	385	12.	.066	.19
11	249	4.	.066	.1
12	302	3.	.0266	.06
13	338	6.8	.06	.16
14	253	5.	.046	.132
15	170	2.	.013	.135
16	280	3.	.026	.243
17	87.196	.....	.....	.....
18	316	15.	.13	.039
19	504	20.	.085	.16
20	770	36.	.026	.19
21	849	265.	.426	.30
22	803	38.	.08	.08
23	.....	.....	.066	.11
24	2.000	532.	.....	.....
25	7,334	.....	.....	.....
26	312	10.	.06	.18
27	500	17.	.18	.23
28	280	9.	.04	.17
29	384	20.	.09	.19
30	2,812	86.	.27	.1
31	428	18.	.02	.2
32	774	110.	.01	.05
33	2,892	1,188.	.64	.16
34	539	27.	.46	.74

We have as a rule followed the practice of determining total solids, chlorine, and free and albuminoid ammonia. The solids are the materials remaining on evaporating the water and naturally consist of the organic and mineral matters in the water. The mineral matter is rarely detrimental to the water, other than as it affects the taste of the water. Sometimes, however, water contains sufficient common salt or even Epsom salts to render it entirely unfit for drinking purposes.

Samples Nos. 17, 24 and 25 are examples of these. The normal chlorine content of pure spring water varies somewhat with the district. In some cases it may not be more than two parts per million, while in others it may amount to seventy-five or more. These variations must be known before interpreting the results. The value of the chlorine figure is due to the fact that chlorine is always found in sewage materials, and when the analysis shows high chlorine and high free and albuminoid ammonia, we assume that the contamination is from an animal source. If the ammonia is high and chlorine low, the assumption is that the organic matter was of vegetable origin, and, consequently, that it is not so dangerous as if it was of animal origin. A water may have a high chlorine content and low ammonia, when it is probable that either the contamination was not of recent date and that the organic matter has all decomposed, or that the soil through which the water is filtering is removing the organic matter and, because of its extreme solubility, the chlorine passes on into the well. Such conditions are dangerous, for at any time the soil may cease to hold back the polluting materials. In such a case a statement of the sanitary conditions surrounding the well is important. Samples Nos. 7, 21 and 33 are extreme examples of pollution from animal source, while samples Nos. 9, 16, 27 and 34 probably derived their organic matter from a vegetable source. Taking into account the information given us regarding the surroundings of the wells, samples Nos. 11, 12, 22 and 32 are safe for use, at least in so far as a chemical analysis will allow us to form an opinion of the water. Possibly some of the others are also safe for domestic purposes, but we would need to get additional information before we could speak more positively on this point.

So many of the samples of water sent to us in the last two years have given evidence of contamination that we have been led to make a fuller investigation of the subject. Last summer, through the Agricultural District Representatives we had 140 samples of water collected and sent to us, together with full notes on the conditions surrounding the well. These waters have been analyzed and it is our intention to prepare a bulletin dealing quite fully with the rural well water supply. Consequently, we will not incorporate the results here.

Wheat and Flour.

During the past year we have tested 342 samples of flour for millers and bakers, and have milled 76 samples of wheat which have been sent to us by millers throughout this and other provinces. Some of these samples have come from the Western provinces and some from the Maritime provinces, and some even from the United States. This phase of our work is becoming more and more known and each year we get more of these samples for testing purposes, as, for example, this year we received 102 more samples of flour than we did last year.

Every year we grind a number of samples of the standard grades of wheat from the West. These we procure as early in the season as possible, so that we may become familiar with the quality of the wheat that will come forward to the millers. At the present time we are working on a set of standard samples covering all the grades and the corresponding average grades of wheat as shipped from the West. The flour that these produce will be baked and exhibited at a meeting of the Dominion Millers' Association, which is to be held in our laboratory. In this way we seek to aid the millers in becoming familiar with the bread-producing capacity of the wheat coming into this province.

Earlier in the season we did a great deal of work on some of the higher grades to ascertain how this year's crop of Western and Ontario wheats compared with that of last year. The following is a summary of this work.

The Quality of Flour from the New Wheat.

For the past two years the quality of the flour obtained from the Western spring wheat has been of such a high order that bakers have had little or no difficulty in getting as good bread from the new flour as from the old. It is very interesting and gratifying to know that such is the case again this year, at least all our baking trials show that even when freshly milled flour from the 1911 crop of wheat was baked in comparative tests with that of the 1910 crop, it gave almost equally good results. The flour from the new crop is only slightly lower in gluten and in water absorption, but in yield of bread and size of loaf it is fully equal to the old flour, while there is a smoothness and silkiness in texture of the crumb of the bread that is superior to that obtained in 1910, and more like that of the flour from the 1909 wheat. The following results in baking trials with patent and bakers' grades of flour illustrate these points. As is usual in our comparative test work, 340 grams of flour were used for a loaf of bread, and the yeast, sugar and salt added in the water used in making the dough. The results given below show the percentage of wet gluten, water absorbed by the flour, the weight and size of the loaf produced, the color and texture of the crumb of the bread, and the general appearance of the loaf. The marks for the color, texture and appearance are arrived at by allotting 100 marks for each of these qualities in the bread made from the flour selected as standard. The marks given for these qualities in the other bread depend upon whether it is better or worse: thus, if it were given a mark of 101 or 102, means that it was better than the standard, or if the marks are less than the 100, it is below the standard.

Below are given the results of the comparative test of the old and new samples of two different well known patent flours. In one case the new flour was baked a day after it was milled, while the old flour was milled some three or four months previously.

	Per cent. of wet gluten.	Per cent. of water absorbed	Weight of loaf, grams.	Volume of loaf, cc.	Quality of loaf.		
					Color.	Texture.	Appearance.
No. 1 Pat., 1910 crop	37.73	71.8	510	2,960	100.	100.	100.
No. 1 Pat., 1911 crop	34.50	69.4	510	2,840	102.	100.	98.
No. 2 Pat., 1910 crop	36.63	69.4	510	2,660	100.	100.	100.
No. 2 Pat., 1911 crop	34.37	67.6	515	2.760	99.	98.5	101.

The above figures illustrate what has been said previously, but while the figures do not show a greater value for texture of the new flour, there is every evidence that when the flour has had proper ageing that it will be superior to that of the old crop. Old and new flour of the bakers' grade from two of our best mills have also been baked and the results from these baking trials follow:

	Per cent. of wet gluten.	Per cent. of water absorbed	Weight of loaf, grams.	Volume of loaf, cc.	Quality of loaf.		
					Color.	Texture.	Appearance.
No. 1 Bakers', 1910 crop.....	41.33	73.7	523	2,960	100.	100.	100.
No. 1 Bakers', 1911 crop.....	41.50	70.6	513	2,960	98.	101.	98.
No. 2 Bakers', 1910 crop.....	41.87	71.8	522	2,740	100.	100.	100.
No. 2 Bakers', 1911 crop.....	38.20	68.8	520	2,670	100.	98.	99.

Again we notice somewhat the same difference as shown in the Patent. As many of the bakers throughout the Province use a considerable amount of the soft flour, it may be of interest to include trials made with this grade of flour. The following results were got from a 90 per cent. flour from mixed soft wheats:

	Per cent. of wet gluten.	Per cent. of water absorbed	Weight of loaf, grams.	Volume of loaf, cc.	Quality of loaf.		
					Color.	Texture.	Appearance.
90% Pat., Soft. 1910.....	28.40	48.1	465	2,010	100.	100.	100.
90% Pat., Soft. 1911.....	28.73	47.1	469	1,800	98.	97.	98.

It is evident that the new wheat is not quite equal to the old in volume, color, texture or appearance, but I think that all experienced handlers of flour will agree with me when I state that a new soft wheat flour will improve more and take longer to do it than is the case with hard flour. I might also say that we could quote other results which would indicate that the difference between the new and the old is not so great as is shown here. Taking it altogether, I may say that it is very evident that if the wheat and flours which have come to our laboratory up to date correctly represent the wheat and flour which will come to Ontario throughout the season, bakers may expect to have at the very least as good a flour as last year. It is, however, quite possible that when we get the wheats from the more western provinces where it is reported that frost and poor harvest weather have more seriously injured wheats, we may have a poorer quality of flour.

Baking Tests of Wheat Grown on Experimental Plots.

Winter Wheats. The results of the baking tests of the winter wheats grown on the experimental plots in 1907 and 1908 have been given in previous reports. The tests for the years 1909, 1910 and 1911 are given below. The varieties grown from year to year are always subject to some changes; consequently, some varieties grown in 1910 have not been repeated this year, and others added to the list. All the different wheats reported on below were milled in our little mill and baked in such a way as to bring out as best we could the characteristic qualities of each flour. Three hundred and forty grams of flour were used for each loaf, and the report is made out in the usual way, showing the percentage of wet gluten and water absorbed, and the weight and size of the loaf and the quality of the bread.

TABLE SHOWING RESULTS OF BAKING TESTS WITH ONTARIO WINTER WHEATS.

Name of Variety.	Crop.	Wet Gluten.	Absorption.	Yield.	Quality of Bread				Protein in Flour.
					Volume.	Color.	Texture.	Appearance.	
		%	%	Grms.	cc.			%	%
Standard	1909	28.10	47.6	466	1,810	100.0	100.0	100.0	.....
	1910	28.43	46.0	459	1,820	100.0	100.0	100.0	8.69
	1911	.....	49.4	494	1,660	100.0	100.0	100.0	.....
Abundance	1909	28.13	51.2	480	1,590	100.0	100.0	97.0	8.77
	1910	21.86	48.8	483	1,460	103.0	97.0	94.0	7.48
	1911	30.57	47.2	465	1,580	110.0	102.0	98.0	.....
Alberta Red	1909	38.73	52.9	487	2,140	98.0	102.5	106.0	10.26
	1910	30.13	53.5	491	1,930	100.0	103.0	102.0	8.93
	1911	39.00	52.3	474	2,160	108.0	106.0	115.0	.....
American Banner	1909	29.03	48.8	478	1,640	98.0	97.0	100.0	8.15
	1910	24.03	48.8	488	1,460	100.0	90.0	90.0	6.73
	1911	32.13	49.4	470	1,660	103.0	100.0	100.0	.....
American Wonder	1909	29.53	53.5	492	1,650	95.0	95.0	98.0	9.5
	1910	23.76	48.8	477	1,440	99.0	.....	.....	7.02
	1911	31.73	49.4	470	1,600	106.0	101.0	99.0	.....
Banatka	1909	37.03	52.9	492	2,550	103.0	110.0	120.0	11.66
	1910	29.40	53.5	477	2,190	102.0	98.0	102.0	9.37
	1911	39.03	56.9	482	2,230	109.0	107.0	120.0	.....
Buda Pesth	19.9	38.33	51.8	473	2,350	100.0	108.0	112.0	11.91
	1910	33.90	51.8	476	1,880	103.0	100.0	102.0	10.75
	1911	38.80	54.7	468	1,900	110.0	105.0	115.0	.....
Bulgarian	1909	36.60	52.9	491	2,140	100.0	103.0	110.0	10.69
	1910	29.13	51.8	474	1,970	103.0	101.0	102.0	9.55
	1911	35.50	51.8	473	1,980	109.0	105.0	114.0	.....
Bulgarian No. 61	1911	37.90	51.8	480	2,100	109.0	105.0	112.0	.....
Crimean Red	1909	36.33	52.3	483	2,280	100.0	103.0	105.0	12.30
	1910	28.27	56.0	493	2,060	102.0	98.0	100.0	9.41
	1911	38.80	57.6	485	2,270	106.0	105.0	120.0	.....
Dawson's Golden Chaff	1909	29.73	48.8	471	1,660	98.0	103.0	102.0	8.34
	1910	30.13	48.8	463	1,710	100.0	100.0	100.0	9.07
	1911	30.30	51.2	476	1,770	104.0	104.0	102.0	.....
Early Genesee Giant	1909	31.07	51.2	483	1,940	100.0	103.0	104.0	10.10
	1910	25.80	50.0	475	1,720	104.0	100.0	100.0	8.24
	1911	34.53	51.8	472	2,160	108.0	104.0	114.0	.....
Early Red Clawson	1909	29.93	50.0	473	1,720	98.0	100.0	100.0	7.98
	1910	24.86	50.0	476	1,400	100.0	.....	.....	8.72
	1911	31.53	48.8	473	1,600	105.0	97.0	90.0	.....
Egyptian Amber	1909	32.40	52.3	474	2,080	100.0	103.0	103.0	10.54
	1910	30.0	52.8	478	1,930	104.0	102.5	102.0	9.52
	1911	33.60	54.7	478	2,180	109.0	106.0	114.0	.....
Geneva	1909	38.07	51.2	476	2,180	103.0	107.0	110.0	11.30
	1910	33.63	48.8	469	1,740	102.0	102.0	100.0	10.03
	1911	37.83	54.7	485	2,150	105.0	100.0	110.0	.....

TABLE SHOWING RESULTS OF BAKING TESTS WITH ONTARIO WINTER WHEAT—Con.

Name of Variety.	Crop.	Wet Gluten.	Absorption.	Yield.	Volume.	Quality of Bread.			Protein in Flour.
						Color.	Texture.	Appearance.	
		%	%	Grms.	cc.	%	%	%	%
Imperial Amber	1909	36.20	50.0	489	2,010	100.0	105.0	105.0	10.05
	1910	31.20	51.8	472	1,930	104.0	104.0	102.0	9.44
	1911	34.60	51.8	475	2,020	105.0	100.0	110.0	.....
Kentucky Giant	1909	34.57	48.8	474	2,220	102.0	104.0	110.0	10.66
	1910	30.03	50.6	487	1,930	103.0	102.0	102.0	9.19
	1911	35.43	51.8	470	2,000	106.0	102.0	112.0	.....
Kharkoo Winter	1910	33.56	55.9	498	1,890	103.0	101.0	102.0	9.63
	1911	37.40	56.0	485	2,100	103.0	100.0	112.0	.....
Gillespie White No. 215	1910	19.00	50.0	474	1,600	100.0	80.0	80.0	7.09
	1911	28.40	50.0	469	1,820	103.0	99.0	103.0	.....
Gillespie Red No. 216	1910	25.56	50.0	472	1,660	100.0	.....	.....	8.25
	1911	31.33	48.8	482	1.930	105.0	103.0	103.0	.....
Grand Prize	1910	24.27	49.4	478	1,590	102.0	85.0	90.0	7.82
	1911	27.97	50.0	472	1,570	104.0	92.0	90.0	.....
Manitoba Red Fife	1909	32.40	51.2	483	1,760	98.0	98.0	100.0	10.73
	1910	27.63	48.8	468	1,610	101.0	99.0	99.0	9.04
	1911	33.00	51.8	475	1,960	104.0	99.0	103.0	.....
Michigan Amber	1909	33.93	51.2	480	2,120	104.0	107.0	110.0	9.84
	1910	28.70	50.0	480	2,000	104.0	97.0	102.0	9.46
	1911	34.47	51.8	466	2,240	110.0	106.0	106.0	.....
McPherson	1909	37.80	48.8	463	1,980	98.0	101.0	103.0	10.66
	1910	28.93	48.8	476	1.920	104.5	103.0	104.0	9.69
	1911	34.80	50.6	466	1,960	108.0	102.0	106.0	.....
Nigger Wheat	1909	34.70	50.6	478	1,870	94.0	97.0	104.0	11.08
	1910	30.86	51.2	471	1,710	103.0	100.0	95.5	8.21
	1911	36.57	52.9	467	2,090	109.0	101.0	110.0	.....
No. 5 Red Wheat	1909	37.57	59.4	502	2,010	98.0	100.0	101.0	10.63
	1910	32.03	56.0	499	2,030	102.0	98.0	102.0	8.83
	1911	34.63	52.9	473	2,010	109.0	103.0	108.0	.....
Northwestern	1909	31.37	48.8	468	2,060	98.0	102.0	104.0	10.43
	1910	29.73	50.0	475	1,870	104.0	100.0	100.0	9.42
	1911	36.43	51.8	467	2,000	109.0	101.0	108.0	.....
Rudy	1909	34.17	50.0	469	2,210	103.0	108.0	110.0	10.78
	1910	33.93	52.3	474	2,020	103.0	99.0	101.0	9.23
	1911	36.73	53.5	473	2,240	103.0	98.0	114.0	.....
Scott	1909	37.67	53.5	495	2,220	101.0	106.0	106.0	10.88
	1910	28.60	51.2	478	1.840	103.0	102.0	102.0	9.23
	1911	33.00	51.8	469	1,800	102.0	97.0	99.0	.....
Tasmania Red	1909	37.13	55.9	485	2,250	102.0	106.0	108.0	11.25
	1910	33.50	50.0	480	1.940	102.0	102.0	102.0	9.55
	1911	35.90	61.7	503	2,190	105.0	101.0	115.0	.....

TABLE SHOWING RESULTS OF BAKING TESTS WITH ONTARIO WINTER WHEAT.—Con.

Name of Variety.	Crop.	Wet Gluten.	Absorption.	Yield.	Volume.	Quality of Bread.			Protein in flour.
						Color.	Texture.	Appearance.	
		%	%	Grms.	c.c.	%	%		%
Treadwell	1909	35.83	51.8	487	2,000	98.0	98.0	106.0	10.08
	1910	30.73	51.2	485	1,850	104.0	100.0	102.5	8.68
	1911	37.63	54.7	482	2,490	108.0	105.0	120.0	.....
Tuscan Isle	1909	36.17	50.6	467	2,340	98.0	102.0	110.0	11.85
	1910	30.10	51.2	473	2,010	103.0	102.0	102.0	9.4
	1911	35.37	56.9	444	2,220	108.0	104.0	115.0	.....
Theiss	1911	39.50	53.5	474	2,000	103.0	100.0	114.0	.....
Yarsolaf	1909	36.17	48.8	475	2,250	99.0	104.0	110.0	10.31
	1910	31.13	53.5	473	2,130	98.0	100.0	102.0	9.43
	1911	38.73	53.5	466	2,360	104.0	100.0	120.0	.....
Virginia Miracle	1910	39.23	52.3	478	2,100	104.0	106.0	114.0	.....
	1911	40.23	53.5	476	2,070	108.0	110.0	114.0	.....
Turkey Red	1909	35.00	50.0	466	2,090	104.0	100.0	112.0	10.47
	1910	30.70	52.3	476	1,920	103.0	102.5	102.0	.....
	1911	35.00	57.6	486	1,860	90.0	90.0	100.0	.....

This year we have again used a straight grade winter wheat flour made in a large flour mill from mixed wheats as a standard. How it compares with the standard of last year may be seen by comparing the data given for the standards of 1910 and 1911.

The above data shows that the quality of the winter wheats grown on the experimental plots in 1911 was superior to that of 1910. With two or three exceptions, the loaf was larger, and the crumb of the bread was better, both in color and in texture. The flour from the 1909 crop was allowed to fully age before baking, while that from the 1910 and 1911 crops was baked almost immediately after milling. Fall wheat flour, especially, requires ageing to give the best results in the baking tests, but we have been endeavoring to get the report out earlier so that it will be more useful to those who may wish to study the results. The apparently better results obtained from the 1909 crop is partly due to the longer ageing. Both the other crops will improve with time.

Ontario Spring Wheats. For the past two years we have been able to report the baking tests of the varieties of winter wheats grown on the experimental plots in the current year. We have never been able to get the spring wheats into the laboratory in time for this work, and consequently, the report has been made one year late. In the following table we give the results of the baking tests of the varieties grown in 1909 and 1910. Some few of the varieties grown in the former year have been dropped, but we have retained these in the list for the sake of comparison. The baking tests were made in the same way as with the winter wheats. The standard in this case, however, was an 85 per cent. spring wheat flour made in one of our large commerical mills.

TABLE SHOWING RESULTS OF BAKING TESTS WITH ONTARIO SPRING WHEATS.

Name of Variety.	Crop.	Wet Gluten.	Absorption.	Yield.	Volume.	Quality of Bread.			Protein in Flour.
						Color.	Texture.	Appearance.	
		%	%	Grms.	c.c.	%	%	%	%
Standard	1909	38.70	54.7	467	2,570	100.0	100.0	100.0	.....
	1910	39.60	60.6	479	2,460	100.0	100.0	100.0	.....
Preston Springs	1909	38.90	51.8	466	2,420	98.0	102.0	99.0	11.16
	1910	34.17	54.7	479	2,100	90.0	80.0	90.0	.....
Red Fern	1909	33.93	48.8	465	2,070	97.0	80.0	90.0	11.1
	1910	33.10	54.7	481	1,950	90.0	.....	80.0	.....
White Russian	1909	36.07	48.8	454	2,300	104.0	99.5	99.0	11.1
	1910	34.53	54.7	491	2,130	100.0	95.0	90.0	.....
Red Fife	1909	40.0	48.8	459	2,320	102.0	100.0	99.0	11.43
	1910	36.33	53.5	479	2,100	101.0	96.0	90.0	.....
White Fife	1909	39.20	53.5	467	2,480	102.0	100.0	100.0	12.25
	1910	33.20	57.6	484	2,300	100.0	99.0	100.0	.....
Pringle's Champion	1909	32.17	48.8	470	2,160	98.0	95.0	90.0	10.61
	1910	34.10	52.9	474	1,950	90.0	.....	80.0	.....
Perron White	1909	31.96	48.8	460	2,200	100.0	96.0	95.0	10.66
Perron Red	1909	36.40	50.0	467	2,190	100.0	100.0	100.0	11.79
Ontario Emmer	1909	36.13	57.6	489	1,860	97.0	.....	.....	11.27
Gatineau	1909	40.90	51.8	470	2,440	101.0	100.0	100.0	12.82
	1910	38.67	61.2	477	2,340	100.0	95.0	100.0	.....
Minnesota 163	1909	37.83	51.8	467	2,310	103.0	97.0	98.0	12.08
	1910	33.37	54.7	479	2,240	100.0	92.0	96.0	.....
Minnesota 169	1909	38.07	50.6	474	2,200	101.0	99.0	97.0	11.67
Early Java	1909	38.20	51.8	468	2,560	101.0	100.0	100.0	11.71
	1910	38.67	54.7	469	2,300	98.0	92.0	95.0	.....
Hungarian	1909	32.17	50.0	465	2,280	103.0	102.0	99.0	11.52
	1910	33.60	54.7	473	2,440	103.0	95.0	95.0	.....
Russian Arg	1909	38.00	50.0	470	2,300	100.5	102.0	99.0	12.65
French	1909	39.53	48.8	464	2,460	103.0	102.0	99.0	12.00
French Bald	1909	37.17	48.8	465	1,990	100.0	100.0	97.0	11.88
Climax	1909	38.60	48.8	469	2,060	98.0	90.0	90.0	11.1
	1910	33.93	51.8	469	2,070	91.0	.....	80.0	.....
Herison (Bearded)	1909	37.20	48.8	458	2,250	100.0	100.0	98.0	11.83
	1910	33.50	51.8	470	2,210	98.0	90.0	92.0	.....
Carleton	1909	34.67	48.8	468	1,950	96.0	90.0	90.0	11.00
	1910	36.17	63.5	477	2,030	90.0	.....	80.0	.....
Chubut	1909	36.63	54.1	479	2,230	99.5	93.0	98.0	11.68

TABLE SHOWING RESULTS OF BAKING TESTS WITH ONTARIO SPRING WHEATS.—Con.

Name of Variety.	Crop.	Wet Gluten.	Absorption.	Yield.	Volume.	Quality of bread. Color.	Texture	Appearance.	Protein in flour.
		%	%	Grms.	c.c.	%	%	%	%
Early Wonder	1909	38.43	54.7	478	2,150	103.0	102.0	98.0	12.26
Wellman Fife	1909	36.10	48.8	458	2,340	102.0	99.0	99.0	11.28
	1910	39.10	54.7	482	2,300	100.0	92.0	96.0	.....
Persian	1909	44.37	72.3	525	2,130	.....	.....	.....	15.42
	1910	37.07	75.2	543	1,940	90.0	85.0	80.0	.....
Saxonka	1909	32.70	48.8	475	1,920	98.0	94.0	95.0	10.94
	1910	33.80	54.7	490	2,020	92.0	80.0	85.0	.....
Chappel	1909	31.33	48.8	460	2,090	100.0	95.0	90.0	10.57
	1910	35.53	53.5	477	2,110	91.0	.....	80.0	.....
Queensland	1909	39.93	51.8	458	2,160	101.0	99.5	95.0	11.4
	1910	31.73	60.6	495	2,410	100.0	100.0	100.0	.....
Seven Headed	1909	33.97	54.7	498	1,700	.....	80.0	.....	10.68
	1910	42.80	72.3	535	1,930	90.0	85.0	70.0	.....
Kolben	1909	41.50	54.7	471	2,420	103.0	100.0	100.0	12.56
Polish	1909	40.0	60.6	504	1,750	.....	80.0	.....	13.09
Kubanka	1909	37.10	57.6	487	2,110	90.0	95.5	90.0	10.96
	1910	34.87	66.5	511	2,100	90.0	85.0	84.0	.....
Medeah	1909	39.93	63.2	504	1,830	yellow	80.0	.....	12.51
	1910	40.23	77.1	554	1,870	90.0	85.0	70.0	.....
Arnautka	1909	34.83	57.6	490	1,850	yellow	90.0	.....	11.48
	1910	38.57	66.5	515	1,920	90.0	85.0	75.0	.....
Sorentina	1909	38.90	66.5	510	1,700	yellow	80.0	.....	13.25
	1910	43.30	75.2	541	1,850	85.0	90.0	70.0	.....
Triticum	1909	37.10	58.8	488	2,070	yellow	95.0	90.0	11.71
	1910	36.63	61.2	503	2,220	90.0	95.0	85.0	.....
Jumillo	1909	38.15	63.2	512	1,660	.....	.....	.....	.....
	1910	40.30	75.2	545	1,660	80.0	85.0	70.0	.....
Wild Goose	1909	35.85	57.6	485	2,110	yellow	73.0	90.0	12.24
	1910	39.23	66.5	510	2,230	90.0	96.0	90.0	.....
Algiers	1909	36.65	61.7	509	1,660	.....	.....	.....	12.4
Bart Tremenia	1909	38.30	63.2	520	1,740	95.0	.....	.....	11.75
Blue Democrat	1909	35.05	48.8	471	2,030	101.0	95.0	90.0	11.27
Roumania	1909	38.80	62.4	512	1,770	90.0	.....	.....	10.83
	1910	37.77	69.4	524	1,710	85.0	80.0	70.0	.....
Hartz Mts	1909	40.60	48.8	462	2,200	100.0	96.0	96.0	12.6
Colorado	1909	33.37	48.8	469	2,170	99.0	97.0	95.0	10.85
Read's Reliable	1910	35.43	51.8	474	2,150	98.0	98.0	95.0	.....

The above results show that in the majority of cases the 1910 crop contained less gluten than that of 1909. With regard to absorption, the 1910 is, in most cases, better than that of 1909. The yield of bread, consequently, is higher, but the volume of the loaf is less. Generally speaking, the quality of the bread from the 1910 crop is inferior to that of the 1909.

It will be noticed that in a number of cases no figures have been assigned for quality of bread. In every case, this is due to the fact that the color and texture, or the general appearance of the loaf, was so inferior that it was impossible to make a comparison of these points. In most cases these varieties are of the Durum type, and, while they contain a high percentage of wet gluten, we have never been able to so mill these as to get a quality of flour from them equal to the other varieties.

The old Red and White Fife wheats still hold a good place among the spring wheats, although we notice that Preston Spring, Gatineau and Hungarian gave a rather larger volume of loaf, and about equal in quality.

Sprouted Wheat.*

Every miller and baker is familiar with the fact that the flour made from sprouted wheat is usually of a very inferior quality. Naturally, such wheat is graded very low and the price is in keeping with the quality. Germination brings about changes in the constituents of the wheat whereby they are rendered soluble. Thus, some of the starch, protein, etc., are changed to soluble forms to feed the young plant. These materials are also essential for the proper development of the yeast in bread-making, but too much is undesirable, and, furthermore, the breaking down of the protein is associated with the disintegration of the gluten. Consequently, the bread is dark colored and poor in texture, and altogether an undesirable article.

However, the thought presents itself, if these soluble constituents are desirable, would the amount in wheat only slightly germinated be insufficient to spoil the flour, and might it not actually be beneficial? The point may be of more theoretical than practical value, yet in view of the fact that wheat is sometimes slightly sprouted, or is wet in storage, and that most hard wheat is steamed or dampened before milling, it was thought to be worthy of study.†

In January of this year two samples of wheat of the crop of 1910 were selected for the investigation. One was a soft Ontario winter wheat and the other a Manitoba spring wheat of medium grade. The wheats were thoroughly cleaned and screened to remove all shrunken and broken grains that might interfere with complete germination. The samples were then divided into four portions. One was kept in normal condition for comparative purposes and the other three were subjected to conditions of temperature and moisture favorable for germination. When the little sprouts were about equal to the length of the kernel one lot of each kind of wheat was spread out and placed where it would slowly dry and the germination thereby be stopped. A second pair of samples were dried when the sprouts were about twice the length of the kernel, and the third when the sprouts were from an inch to an inch and a half long. Naturally, the germination was

* Re-written from Mr. A. J. Galbraith's thesis.

† This work was also suggested by some work done by G. R. Olson, of the Washington State Experiment station, which was afterwards reported in the April number of the *American Food Journal.*

not absolutely uniform, but the length of sprout given was approximately the average. After the wheat had been exposed for four or five days and the moisture content normal, all the eight samples were milled in one of the small Allis-Chalmers experimental mills. No attempt was made to determine the yield of flour, as we do not think this can be done accurately in this mill.

As expected, the flours showed considerable difference in appearance. That from the least sprouted wheat had the best color, while that from the more extended germination was very dark. On washing out the glutens it was found that the flour from the wheat with the shortest sprouts handled quite normally. The gluten from the second sample was rather soft and runny, and the third was so poor that it was impossible to make a satisfactory determination of the amount of it present.

The flour was then submitted to the usual baking trials as followed out in our testing laboratory, 340 grams of flour being used for each loaf. The following table gives the weight of each loaf of bread, its volume, the comparative color and texture of the crumb, and general appearance of the outside of the loaf as compared with the bread obtained from the normal unsprouted wheat.

Sample of Wheat.	Per cent of Protein (N.x5.7)	Per cent of Wet Gluten.	Per cent. of water absorbed.	Weight of loaf. Grams.	Volume of loaf. cc.	Quality of loaf.		
						Color.	Texture.	Appearance.
Ontario Winter Wheat								
Normal.....	10.8	28.	47.65	469	1,670	100	100	100
No. 1 Sprouted..	10.73	25.97	47.65	471	1,730	100	102	101
No. 2 " ..	10.8	22.03	47.65	473	1,450	97	Poor	Poor
No. 3 " ..	10.77	.....	47.05	468	1,270	95	Poorer	Poorer
Manitoba Spring Wheat:								
Normal.....	13.48	39.93	75.3	527	2,900	100	100	100
No. 1 Sprouted..	13.52	39.47	67.65	496	2,900	104	102	104
No. 2 " ..	13.44	38.87	63.53	486	2,600	102.5	90	97
No. 3 " ..	13.46	.....	63.53	489	2,430	100	80	93

The most singular fact brought out in the above results is that the quality of the bread made from the flour of the No. 1 sample of sprouted wheat was, in both cases, superior in color, texture and in general appearance of the loaf to that obtained from the normal unsprouted wheat. In the case of the Winter wheat, the loaf was even slightly larger. The more extended germination allowed in samples Nos. 2 and 3 apparently injured the gluten of the Winter wheat more than that of the Spring wheat. This is seen in the gluten column and also in the lower number of marks given for the quality of the bread.

The difference in the appearance of the loaves is further shown in the accompanying cuts. In the case of the bread from the hard spring wheat especially, notice the well rounded, bold appearance of the No. 2 loaf and the gradual decrease in size of the Nos. 3 and 4 with both kinds of wheat. From the above figures it is also evident that there is even a greater decrease in the quality of the crumb of the bread. However, this is as might be expected, but the chief point of interest is that the wheat which was only slightly sprouted produced a better loaf than the normal unsprouted sample. From the results obtained, it is evident that the Nos. 2 and 3 sprouted samples were unfit for break-making purposes; but, in actual practice would not the slightly sprouted wheat be graded practically as low

as the others? On the other hand, it is only fair to point out that the yield of flour would be lower when any germination had taken place.

A further study of the wheat was made to ascertain what effect the germination had on the nitrogen compounds and on the starch. In this work 70 per cent. alcohol and 10 per cent. salt solution were used in determining the alcohol soluble, or gliadin nitrogen, and salt soluble compounds, respectively, and the amides were separated by the Stutzer's reagent. The glutenin was determined by difference. All the analyses were made of finely ground samples of wheat, including the sprouts, as we wished to get at the total change of the constituents in the wheat.

PER CENT. OF NITROGEN IN VARIOUS FORMS OF COMBINATION.

Sample of Wheat.	Moisture.	Total Nitrogen.	Alcohol Soluble Nitrogen.	Glutenin Nitrogen.	Salt Soluble Nitrogen.	Amide Nitrogen.
Ontario Winter Wheat:						
Normal	11.31	1.895	.833	.563	.499	.170
No. 1 Sprouted	11.27	1.891	.829	.547	.515	.172
No. 2 Sprouted	10.87	1.889	.824	.519	.546	.536
No. 3 Sprouted	11.25	1.890	.....	.....	.....	.708
Manitoba Spring Wheat:						
Normal	10.25	2.365	.928	.855	.582	.175
No. 1 Sprouted	10.17	2.354	.930	.811	.613	.337
No. 2 Sprouted	10.12	2.358	.928	.763	.659	.539
No. 3 Sprouted	10.21	2.350	.....	.....	.....	.700

Evidently the various samples of each kind of wheat had dried so that they contained about an equal amount of moisture. The quantity of alcohol soluble nitrogen is apparently not influenced by the germination, but the salt soluble compounds are slightly, and the amides very materially affected. Unfortunately, no determinations were made of the alcohol and salt soluble compounds in the wheat that had the longest sprout. In the following table the results are expressed in per cent. of the total nitrogen, which serves to bring out the changes in the nature of the nitrogen compounds a little more clearly.

EXPRESSED IN PER CENT. OF TOTAL NITROGEN.

——	Per cent total Nitrogen.	Per cent. Alcohol Soluble Nitrogen.	Per cent. Glutenin Nitrogen.	Per cent. Salt Soluble Nitrogen.	Per cent. Amide Nitrogen.
Ontario Winter Wheat:					
Normal	100	43.95	29.71	26.33	9.0
No. 1 Sprouted	100	43.83	28.91	27.23	9.1
No. 2 Sprouted	100	43.62	27.44	28.90	28.37
No. 3 Sprouted	100	.....	.....	.....	37.46
Manitoba Spring Wheat:					
Normal	100	39.23	36.15	24.61	7.4
No. 1 Sprouted	100	39.51	34.45	26.04	14.31
No. 2 Sprouted	100	39.35	32.36	27.94	22.86
No. 3 Sprouted	100	.....	.....	.....	29.79

Although much time has been given to the chemical study of these nitrogen compounds, we are not in a position to state definitely their influence on the bread-making value of the flour. However, the results do show that while the alcohol soluble or gliadin nitrogen remains unchanged, the amount of glutenin nitrogen decreases and the amide nitrogen increases. Apparently the destruction of the gluten is accompanied by these changes.

In studying the carbohydrate materials, the sugars were separated by means of boiling alcohol and the soluble starch and dextrin by extracting the residue with cold water. The starch was determined by malting and inverting by the official method. The results obtained will be found in the following table:

PER CENT. OF VARIOUS FORMS OF CARBOHYDRATES IN THE WHEAT.

Sample of Wheat.	Total Sugars.	Soluble Starch and Dextrin.	Starch.
Ontario Winter Wheat:			
Normal	.9	3.46	65.3
No. 1 Sprouted	1.44	3.22	64.8
No. 2 "	1.63	4.03	63.7
No. 3 "	2.83	4.23	62.9
Manitoba Spring Wheat:			
Normal	1.02	3.66	64.4
No. 1 Sprouted	1.48	3.55	63.7
No. 2 "	2.39	4.62	61.9
No. 3 "	3.02	5.22	59.8

As might be expected, the above results show that the percentage of starch present in the grain decreases and the soluble carbohydrates increase. These soluble carbohydrates and the soluble protein are essential food constituents of the yeast, and possibly the better quality of bread obtained from the slightly sprouted wheat was due to the extra food materials present. On the other hand, too large an amount of the soluble carbohydrates in the flour or dough is always associated with a poor color and texture of bread, and, even if the gluten was not destroyed by the longer germination, it is probable that the bread made from these samples would not have been so good as that obtained from the normal wheat. Apparently the breadmaking value of the wheat is improved by germination provided this is not continued too far. When this has taken place the dough "works" very fast, doubtless due to the large amount of available food present, but the dough will not "rise" properly because the gluten, or, at least, the tenacious nature of the gluten, has been destroyed.

It is worthy of note that the above results agree with that reported by Olson, of the Washington State Experiment Station, previously referred to, and, furthermore, that the work was completed before Olson's work was published. The writer does not claim that it will pay to germinate wheat, but the results indicate that wheat that has been wet in the bin or even slightly sprouted in the stook is not spoiled for milling purposes, always provided it has not become musty. It also indicates that even if considerably sprouted, it may be used with normal wheat without doing harm, and with the likelihood of improving the quality of the bread. It is a well-known fact that malt extract prepared from sprouted barley is extensively used in bread making, and there does not appear to be any good reason why the use of some sprouted wheat in making the flour should not be beneficial. However, we have no results to present in confirmation of the point, and we do not wish to lay much stress on it.

Lime-Sulphur Wash.

Effect of Adding Lime. On page 100 of the Report for the year 1910 the effect of adding lime to the Lime-Sulphur wash is discussed and analytical figures given, which show that there is probably not enough change in the composition of the wash due to the addition of the lime to afford sufficient reason for condemning the practice. We have pursued this study again this year and wish to submit the following table* of figures giving the results of our work:—

Sample No.	Dilution.	Treatment.	Pounds Lime (CaO) per gal. of Spray.	Total Sulphur Lbs. per gal. of Spray.	Sx-1 Sulphur Lbs. per gal. of Spray.	CaS Sulphur Lbs. per gal. of Spray
1	1: 9	Limed	0.15	0.312	0.240	0.075
2	1: 9	Untreated ..	.....	0.312	0.237	0.075
3	1:49	Limed	0.15	0.062	0.051	0.014
4	1:49	Untreated..	.....	0.062	0.051	0.015

It is quite evident, on examination of the above table, that the wash has not suffered any change in composition when limed. These results are even more conclusive than those of last year, and we now have no hesitation in stating that there is no objection whatever to the practice of adding lime to the Lime-Sulphur spray. It is to be understood, of course, that the lime must not be put in till after the necessary quantity of water has been added to the concentrate to dilute it to the required strength.

Lead Arsenates.

Lead arsenate is probably the best insecticide for controlling biting insects which we have at present. This is so on account of the fact that it is less likely to cause injury to foliage than such arsenicals as Paris green and calcium arsenite, and further, that it adheres very firmly to the foliage and is less easily washed off by rains. Moreover, with the modern tendency to apply arsenicals along with the Lime Sulphur spray, in order to overcome the necessity of two sprayings where one will do just as well, it is essential to use an arsenical which will neither materially affect the composition of the wash nor itself become much changed. This requirement seems to be best met by lead arsenate.

For these reasons lead arsenate is gradually displacing all other arsenicals in spraying operations.

During the past summer we analysed several of the more common commercial lead arsenates on the market, and the results are included in the following table:—

* The Sx-1 and CaS sulphur were determined by decomposing the wash with HCl to acid reaction, and estimating the H_2S and liberating the sulphur. The H_2S sulphur will represent that equivalent to CaS and Sx-1, the remainder according to the following equations:

$$CaS_x + 2HCl = CaCl_2 + H_2S + S_{x-1}.$$

Sample No.	Manufacturer.	Water.	Lead oxide PbO	Arsenic Oxide As_2O_5	Figured to dry basis.		Lead arsenate as :	
		%	%	%	As_2O_5 %	PbO. %	PbH. %	Pb_3 %
347	Graselli Co., Cleveland.....	40.49	40.335	16.744	28.14	67.78	44.00	53.00
348	Chemical Laboratories, Toronto	42.81	41.285	13.886	24.28	72.19	.....	100.00
349	Sherwin-Williams, Cleveland.	50.48	35.020	13.678	27.62	70.72	29.66	69.84
306	Niagara Brand Spray Co., Burlington	24.23	54.492	18.544	24.47	71.92	.....	98.00
372	Hemingway London Purple Co.	48.32	32.904	16.634	32.18	63.67	92.50	6.50
373	Swifts	45.14	34.803	13.774	32.40	63.44	95.60	2.00
436	May & Baker, London, Eng,..	47.24	30.564	16.429	31.14	57.93	100.00	.....
555	E. Merck, Darmstadt, Germany	1.01	73.425	23.632	23.87	74.17	.....	100.00
346	Graselli Co., Cleveland.....	0.53	68.14	27.147	27.29	68.5	33.64	62.59

Lead arsenate comes on the market in two forms—as a paste and as a powder. Nos. 346 and 555 are the only ones in the table that are powders. The powder form does not work up quite so well with water, but on the other hand, it is less bulky for shipping and handling. The pastes contain from 24 to 50 lbs. of water and the powders ½ to 1 lb. in every 100 lbs. of material.

There are two varieties of the arsenate of lead—one is called PbH, or acid, and the other Pb3, or neutral. The former is richer in arsenic. Very often both are present, but one usually dominates. Nos. 347 and 349 have large quantities of each. It is not definitely settled whether there is any difference in the insecticidal value of these two or not, but it is probable that the neutral is slightly safer to use when applied with Lime Sulphur wash.

In conclusion, I wish gratefully to acknowledge the willing and loyal support of those associated with me in the work of the department.

Respectfully submitted,

R. HARCOURT.

PART VII.

THE PROFESSOR OF VETERINARY SCIENCE.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit my report for 1910-11.

CLASS ROOM.

The class room work has been about the same as usual. To the first year students during the fall term I delivered a course of lectures and demonstrations on Veterinary Anatomy; also a course in the erection and fitting of horse stables, the general care of horses as regards working, feeding, watering, grooming, etc.; the care of harness, saddlery, carriages, etc. This was followed by a course in judging horses.

During the winter term I gave a course on Veterinary Materia Medica, speaking of the preparation, properties, actions, uses, doses, and the various ways of administering medicines that are used for the prevention and cure of the ordinary diseases of farm stock.

To the second year, during the fall term, I gave a course of lectures on Veterinary Medicine and Surgery, speaking of causes, symptoms and treatment, both preventive and curative of the various common diseases and injuries to which farm stock is liable. During the winter term I lectured to this class on Veterinary Obstetrics, treating of the phenomena of œstrum, conception, gestation and parturition, the general causes and prevention of sterility, the causes, symptoms and treatment of the various diseases of both sexes incident to reproduction, those of the dam during pregnancy, at and after parturition; also the causes of abortion, both accidental and infectious, with methods of preventing the former and modern methods of ridding a herd of the latter; the treatment and care of both dam and offspring until the latter has reached that age at which it can live independent of the former: also the causes, symptoms and treatment of the various diseases to which the young animal is subject.

In addition to the above, I gave a series of demonstrations of the different methods of controlling horses and cattle for the performance of minor operations, such as dressing and stitching wounds, lancing abscesses, dissecting out tumors, castrating, dressing teeth, scarifying lampass, etc. So far as possible, I illustrated the most approved methods of handling or educating colts or green horses, endeavoring to impress upon the minds of the students that it is profitable to spend some time and labor in training or educating such to go in harness or saddle rather than to attempt to "break" them in a few hours. I also gave a course of practical illustrations on scoring and judging horses of different breeds and classes. For this purpose we have a sufficient number of draught and agricultural horses at the institution, but representatives of other breeds and classes have to be supplied from my own stable or borrowed.

To the fourth year I also gave instructions in horse judging, using for the purpose the horses of the institution, my own horses, and visiting studs of importers and breeders in different parts of the Province.

To the special dairy class I delivered a short course of lectures on the causes, symptoms and treatment of the common diseases to which dairy stock is subject.

To the students of the "Short Course in Stock Judging" I gave a course of practical scoring and judging in the different breeds and classes of horses. In this I was ably assisted by the late Dr. Quin, of Brampton. The success of this course was largely due to the following gentlemen who kindly furnished horses of the different breeds and classes, viz., Messrs. Sorby, McCannell, Tovell, Clancy, Bowman, Hurley, Parsons, Dr. Grenside, Dr. Harvey and others.

Sickness and Injuries.

There were several cases of the ordinary diseases and injuries in the horses, cattle, sheep and swine of the institution, but there were no fatalities except in newly born animals.

Respectfully submitted,

J. H. REED.

PART VIII.

THE PROFESSOR OF DAIRY HUSBANDRY.

To the President of the Ontario Agricultural College:

SIR,—I beg leave to submit my twenty-first annual report of the Dairy Department of the College. This report contains a summary of the experimental and investigational work conducted with reference to dairying during the year. Our Short Courses in Dairying were attended by fifty-one students, of whom thirty-two wrote on the final examinations. Most of these were from creameries and cheese factories. A few were from the farms. As in former years, there were a number of students from the Macdonald Institute who took dairy work during the winter term.

CHANGES IN DAIRY STAFF.

As intimated in my last report, Messrs. Stratton and Taylor, who have been in the dairy for a number of years, resigned to conduct a creamery business in the city of Guelph. Mr. N. S. Golding is now in charge of the Soft Cheese branch, and Demonstrator on our regular Staff. Mr. Fred Dean resigned from the position of Instructor in Buttermaking in the Dairy School. Miss Laura Rose has also resigned as Instructress in Farm Dairy Butter and Cheesemaking, after a number of years of faithful service. We regret very much to lose the services of two such capable and enthusiastic Instructors from our Dairy School Staff. Miss Bella Millar takes Miss Rose's place. Miss Sparrow resigned the position of Stenographer, Bookkeeper and Librarian, after a number of years of satisfactory service.

APPLICANTS FOR DIPLOMAS, 1911.

Name.	Address.	Diploma in
Brown, W. M.	Salem, Ont.	Buttermaking.
Farmer, R. W.	Lacombe, Alta.	Buttermaking.
McEwen, Jas. A.	Jarvis, Ont.	Cheesemaking.
McRae, Frasure R.	Winnipeg, Man.	Buttermaking.
Parker, Floyd.	Merlin, Ont.	Buttermaking.
Reid, Jas.	Lucknow, Ont.	Cheesemaking.
Skelton, R. J.	Hickson, Ont.	Cheesemaking.
Thompson, J. Herbert.	Tantallon, Sask.	Buttermaking.

Official Cow-testing, 1911.

Name and Address. Seven-day tests.	No. of cows.
Abbot, Fred., Harrietsville	8
Allison, J. J., Chesterville	2
Bailey, W. J., Nober	6
Baker, Ed., Winchester	4
Bollert, C., Tavistock	7
Bollert, H., Cassel	8
Brethren, G. A., Norwood	12
Brown, G. C., Lyn	1
Brown, W. W., Lyn	8
Caskey, Jas., Madoc	3
Caughell, David, Yarmouth Centre	4
Chambers, Ed. C., Fairfield Plains	6
Cherry, W. H., Garnett	2
Clare, Herbert, Norwich	2
Clemons, G. W., St. George	6
Coon, S. A., Athens	1
Craig, T. W., Brantford	1
Cueries, Jas. G., Ingersoll	1
Dent, T. H., Woodstock	4
Dowler, Richard, Ottawa, S.	3
Dunkin, T. L., Norwich	8
Dunn, A., Ingersoll	5
Dyment & Smith, Dundas	3
Ede, P. D., Oxford Centre	9
Farewell, A. A., Oshawa	3
Flatt, D. C., & Son, Millgrove	16
Force, Ashton, Vandecar	1
Force, Jas. B., Vandecar	3
Foster, D. D., Bloomfield	7
Gilbert, E. C., Paynes Mills	4
Gilroy, G. A., Glen Buell	3
Goodison, Thos., Manhard	6
Haley, M. H., Springford	7
Hambly, W. E., Rockford	1
Hardy, A. C., Brockville	16
Hartley, Thos., Downsview	6
Harwood, Dr., Vaudreuil, Que.	9
Heron, Robt. A., Billings Bridge	2
Hicks, R. F., Newton Brook	4
Hulet, A. E., Norwich	3
Jerome, Holbert, Glanford	3
Kelly, R. J., Tillsonburg	4
Kennedy, Wm., Rosama	1
Laidlaw, E., & Son, Aylmer	23
Leavens, R. R., Bloomfield	3
Lemon, Samuel, Lynden	10
Lipsit, L. H., Staffordville	14
McDowell, Martin, Vandecar	2
McQueen, T. W., Tillsonburg	9
Mallory, B., Frankford	7
Mallory, J. M., Frankford	1
Mallory, F. R., Frankford	6
Manhard, Gordon H., Manhard	13
Maybee, M. E., Trenton	1
Nelson, P. B., Cambellford	3
Oliver, Geo., Bright	2
Osler, E. F., Bronte	13
Payne, Jas. R., Brinstons Corners	1
Pearce, C. J., Ostrander	1
Pettit, T. E., Burgessville	4
Poole, W. B., Salford	2
Prouse, W. C., Ostrander	1
Rettie, Jas., Norwich	4
Rice, Geo., Tilsonburg	5
Richardson, J. W., Caledonia	3
Rife, David, Hespeler	1
Rife, Wm. A., Hespeler	2
Schell, Walter S., Woodstock	11
Shellington, Jno., Harley	1
Sherwood, G. E., Brockville	2
Shields, Jno., Smith's Falls	2
Smith, C. E., Scotland	9
Smith, Wm., Burgessville	1
Snyder, Elias, Burgessville	6
Stevens, W. C., Phillipsville	7
Stewart, Jno. W., Lyn	2
Strader, Orrin, Brinston	3
Suehring, Otto, Sebringville	2
Teeple, H. H., Curries	2
Thompson, W. E., Woodstock	6
Van Patter, J. M., Aylmer	7
Walker, S. M., Fairfield	1
Wood, Tig., Mitchell	7
Total	412

Fourteen-day tests.

Foster, A. D., Bloomfield	3
Hartley, Thos., Downsview	4
Lipsit, L. H., Staffordville	1
Mallory, B., Frankford	1
Manhard, Gordon H., Manhard	1
Osler, E. F., Bronte	1
Schell, Walter S., Woodstock	1
Van Patter, J. M., Aylmer	1
Total	13

Thirty-day tests.

Clemons, G. W., St. George	5
Dunkin, T. L., Norwich	2
Flatt, D. C., & Son, Millgrove	2
Hardy, A. C., Brockville	2
Hartley, Thos., Downsview	4
Laidlaw, E., & Son, Aylmer	12
Lemon, Samuel, Lynden	4
Lipsit, L. H., Staffordville	9
Mallory, B., Frankford	1
Osler, E. F., Bronte	6
Rice, Geo., Tilsonburg	2
Schell, Walter S., Woodstock	1
Van Patter, J. M., Aylmer	6
Total	56

Last year there were 273 seven-day, 6 fourteen-day, and 32 thirty-day tests. Mr. L. A. Zufelt, Superintendent of the Eastern Dairy School, Kingston, took direct charge of the official tests in Eastern Ontario. All of the cows tested belong to the Holstein-Friesian breed of dairy cattle.

Experimental and Investigational Work.

At the beginning of the calendar year we turned over our commercial creamery to a firm in the city of Guelph, reserving what raw material, milk and cream, we should require for educational and investigational work. Being relieved of this part, allowed more time for practical instruction to students and for conducting experiments in relation to dairy problems. In order to cope with both our commercial and educational features, we should have required double the room and machinery which we now have, and we should also have needed nearly double our present staff. The Commercial branch of the Dairy Department might have been made a profitable feature, had the College desired to engage in this line of work, as the business was growing and on a sound basis.

Under the agreement, we purchase what milk and cream we require from Messrs. Stratton and Taylor at cost price. They also agree to take the butter made by us, which we do not need to hold, in lieu of the cream supplied. So far, the arrangement has proved quite satisfactory, although we ought to have more milk, which means a larger appropriation for the purchase of milk, than we had for the year 1911.

The Soft and Cream Cheese Industry in Canada.

It is a question whether or not one is justified in speaking of the Soft and Cream Cheese made in Canada as an "industry" at the present time. The work has just begun, but there is a steady and growing demand for these cheese, more particularly in winter, as it is found that climatic conditions are not favorable for their sale in hot weather, owing to the fact that they tend to spoil quickly and to become covered with mold.

For the past three years we have been doing more or less work with these cheese and have met with a fair degree of success. Three types of cheese seem to have given us the best results, viz., a fresh Camembert, made from whole milk and eaten before fermentation or ripening takes place, and two classes of Cream Cheese, known as "Gervais" and "Double Cream," the chief differences between the two being their shape—the "Gervais" being circular and the "Double Cream" oblong—and the fact that the "Gervais" is made from part milk and part cream. The latter is usually made from cream containing a rather high percentage of fat.

At the close of the College term in April, the following outline of experimental and investigational work was handed to Mr. Golding, our expert in this branch of the Dairy Department of the College:

Soft Cheese Experiments, 1911.

1. Continue the work of sending samples and experimental shipments to grocers in various parts of the Province of Ontario. Follow up the favorable reports so as to establish a market in as many centres as possible.

2. Experiment to a limited extent:
   - (*a*) Making Stilton Cheese.
   - (*b*) Making other kinds likely to find ready sale in Canada.
   - (*c*) Making ripened Camembert Cheese.
   - (*d*) Making improvements in packages and methods of shipping.

3. Determine the amount of moisture which each kind of soft cheese may safely carry and the amount of draining necessary to obtain the desired percentage of moisture. (Moisture may be determined by drying a definite weight of curd or cheese in a steam oven.)

4. Determine the effects of preservatives on the keeping quality of soft and cream cheese; and effects, if any, on moulds.

5. Determine the effect of various definite temperatures on the keeping quality of cheese and the length of time each kind may be kept without spoiling.

6. Effects of pasteurization of milk and cream for manufacture of soft cheese.

7. Experiments re Devonshire Cream, comparing centrifugal or separator cream with shallow pan cream, and milk pasteurized with non-pasteurized.

Not all of this work was completed, but a beginning was made and we hope to continue the investigations another year.

One of the first lines completed for the year was the effect of several kinds of preservatives applied in varying amounts to the cheese and also the effect of soaking the papers used in wrapping the cheese in various mould destroying solutions.

The main points in the experiments and the results, as given by Mr. Golding, are contained in the following tables:

CAMEMBERT CHEESE.

Salt.	Preservative added.	Treatment of package.	July 27th.	August 3rd.	August 10th.
½ oz. to small cheese.	½ % boric acid.	Soaked in 5% salt solution.	Preservative not apparent to taste.	Mould very slight.	Yellow and blue mould all over cheese.
½ oz. to small cheese.	⅛ % boric acid.	Soaked in 5% salt solution.	Cheese dryer, preservative not apparent to taste.	Little more mould than first one.	Mould on cheese and wrapper.
½ oz. to small cheese.	¼ % borax.	Soaked in 5% salt solution.	Preservative not apparent to taste. Rather soft.	Mould commenced growing.	Moulded badly.
½ oz. to small cheese.	No preservative.	Soaked in 5% salt solution. 1cc. formalin to ½ gallon solution.	Preservative not apparent to taste outside less acid.	Mould commenced growing.	Slimy wrapper. Mould present.
½ oz. to small cheese.	No preservative.	Soaked in 5% solution of salt.	Good.	Mould growing.	Slimy wrapper, stuck to cheese and moulded.
½ oz. to small cheese.	½% sodium benzoate.	Soaked in 5% solution of salt.	Preservative not apparent.	No mould, poor flavor.	Good condition. 2 small spots, flavor fair.

Date rennetted July 20. Date salted and preservative added July 21.
On August 18th, all cheese heavily covered with mould.
These cheese were all kept at 38°F to 45°F.

CREAM CHEESE.

Rate of Salt.	Preservative added.	Treatment of Package.	July 27th.	August 3rd.	Aug. 10th.	Aug. 18.
1 oz. salt to 3 lbs. cheese	¼ % Boric Acid.	Butter paper soaked in 5% salt solution.	Good condition. Pres. not apparent to taste.	No mould. Slight pres. flavor.	Mould started to grow, slight pres. flavor.	Bad buttery flavor and considerable growth of mould.
1 oz. salt to 3 lbs. cheese	½ % Boric Acid.	Butter paper soaked in 5% salt solution.	Good condition. Pres. not apparent to taste.	No mould. Slight pres. flavor.	Mould starting, fair flavor, slightly old.	
1 oz. salt to 3 lbs. cheese	¼ % Borax	Butter paper soaked in 5% salt solution.	Good condition. Pres. not apparent to taste.	No mould. Slight pres. flavor.	No mould; slightly old flavor.	
1 oz. salt to 3 lbs. cheese	No preservative.	Butter paper soaked in 5% salt solution and 1cc. formalin per ½ gallon.	Good condition. Pres. not apparent to taste.	No mould. No pres. flavor.	No mould; bad flavor, but not rancid.	
1 oz. salt to 3 lbs. cheese	No preservative.	Butter paper soaked in 5% salt solution.	Good condition. Pres. not apparent to taste.	No mould. No pres. flavor.	No mould; fair flavor.	
1 oz. salt to 2 lbs. cheese	No preservative.	Butter paper soaked in 5% salt solution.	Good condition. Pres. not apparent to taste.	No mould. No pres. flavor.	Some mould; bad flavor.	
1 oz. salt to 3 lbs. cheese	¼ % Sodium Benzoate.	Butter paper soaked in 5% salt solution.	Good condition. Pres. not apparent to taste.	No mould. Pres. flavor.	No mould; strong pres. flavor.	
1 oz. salt to 3 lbs. cheese	No preservative.	Put in glass with grease-proof paper on top.	Good condition. Pres. not apparent to taste.	Good flavor.	Best flavor of lot. Some mould on top; moisture retained better.	Fair flavor.

Date rennetted, July 19, 8 p.m. Date salted and preservative added, July 24.
These cheese were all kept at 38° F to 45° F.

GERVAIS CREAM CHEESE.

Rate of Salt.	Preservative added.	Treatment of Package.	27th July.	3rd August.	10th August.	18th August.
1 oz. to 3 lbs. curd.	½ % boric acid.	Ordinary package paper soaked in salt solution.	Cheese in good condition, no preservative flavor.	Same as 27th.	White mould on paper, but flavor good.	Past eatable condition.
1 oz. to 3 lbs. curd.	½ % boric acid.	Ordinary package paper soaked in salt solution.	Cheese in good condition, no preservative flavor.	No mould. No preservative flavor.	Blue mould on paper & cheese, more than No. 1.	
1 oz. to 3 lbs. curd.	½ % borax.	Ordinary package paper soaked in salt solution.	Cheese in good condition, no preservative flavor.	No mould. No preservative flavor.	Mould on out and inside of package. Paper damp.	
1 oz. to 3 lbs. curd.	No preservative.	Ordinary package paper soaked in salt solution and 1 cc. formalin per half gallon.	Cheese in good condition, no preservative flavor.	No mould. No preservative flavor.	Small spots of white mould. End not opened in good condition. Blue mould on end which had been open.	
1 oz. to 3 lbs. curd.	No preservative.	Papers soaked in salt solution.	Cheese in good condition, no preservative flavor.	No mould. No preservative flavor.	White and blue mould. Mouldy flavor.	
1 oz. to 2 lbs. curd.	No preservative.	Papers soaked in salt solution.	Cheese in good condition, no preservative flavor.	Flavor poor.	Blue mould. Fair condition, but dry.	
1 oz. to 3 lbs. curd.	½ % sodium benzoate.	Papers soaked in salt solution.	Cheese in good condition, no preservative flavor.	Bad flavor.	No mould. Very bad flavor.	No great quantity of mould, but very bad flavor.
1 oz. to 3 lbs. curd.	No preservative.	Put in glass jar with grease proof paper and tin lid on top.	Cheese in good condition, no preservative flavor.	No mould. No preservative flavor.	Mould on surface. Flavor good. Soft and good texture.	

Date rennetted, July 19, 8 p.m. Date salted and preservative added, July 21.
These cheese were all kept at 38° F. to 45° F.

Conclusions.

Under the conditions given, boric acid, borax, or benzoate of soda, in the amounts used, were not satisfactory as preservatives for these cheese, leaving the question of their healthfulness out of consideration. The benzoate of soda prevented the growth of mold to a certain extent, but this substance gave more or less of an undesirable flavor to the cheese.

This work, however, should be considered as a preliminary report. Further work will be needed in order to draw safe conclusions.

The tendency is to look with suspicion on all food preservatives, other than a few common ones, such as sugar, salt, vinegar. It is a question, whether or not, the use of these so-called preservatives in food should be encouraged. My own judgment is that they ought not to be used and we were pleased that these preliminary tests with soft cheese indicated little or no improvement by using substances, which may, at least, be placed in the doubtful column of products suitable for human consumption. We shall probably have to look in some other direction for means of combating the growth of molds, and the tendency to rapid deterioration in soft and cream cheese during warm weather.

Effect of Temperature on Keeping Quality of "Soft" and Cream Cheese.

Tests were made during June, September and October, with fresh Camembert, Cream and Gervais cheese, kept in an ordinary house refrigerator, where the temperature ranged from 46° to 55°F; in an ice cold storage where the temperature was 30°F in June, and 48° in September and October; in mechanical cold storage on the circulating air system of 29°F; and also on cheese kept at an ordinary room temperature of 60° to 75°F.

The general results of this work indicate:

1. The Camembert cheese kept in the house refrigerator were unsaleable in about a week or ten days, while the cream cheese remained good for ten to twelve days under similar conditions.

2. In the ice-cold storage all the cheese kept in first-class condition for about two weeks, but they tended to become moldy and go off in flavor after two weeks.

3. Where the cheese were placed in mechanical storage at a temperature 3° below freezing point, the cheese kept well for three weeks and were in fairly good condition at the end of nearly a month.

4. Those cheese kept at ordinary room temperature began to go off in flavor and become moldy in about five days.

The practical lesson to be learned is that these soft and cream cheese must be kept at low temperatures and in a comparatively dry air, such as is got by the Linde system, if they are to be kept for any length of time. The better and safer plan is to have them consumed in a short time after making, but if they are kept for some time by the dealer or maker, they must be held at a low temperature to prevent spoiling.

Soft and Cream Cheese-Ripening and Coloring.

Ripening Camembert Cheese. The original Camembert Cheese is one which is allowed to ripen. In our work we have sold them when fresh. In order, however, to ascertain whether or not satisfactory results could be got by ripening these cheese, several tests were made by varying the method of manufacture, inoculating with old Camembert cheese, etc. The results may be summed up briefly

by saying that the ripening of these cheese was not satisfactory. We have yet to learn how to make and ripen the cheese which are so successfully made by the cheesemakers of France. A Pont L'Eveque cheese was ripened with very good results.

Coloring. As most cheese eaters like a rich, yellow color in cheese, and sometimes object to the fresh Camembert because of its white color, a number of tests were made using ordinary cheese coloring at rates of 5, 10, and 15cc per 100 lbs. of milk, for coloring Camembert cheese. None of the results were satisfactory, as the cheese were all more or less mottled. For coloring the cream cheese, quantities of Cheese Annatto coloring were used, varying from 10cc to 40cc per per 100 lbs. cream, testing 30 per cent. fat. The best results were got by using 20cc per 100 lbs cream—30 and 40cc gave too high a color.

The Gervais color was best when using 10cc cheese coloring per 100 lbs. mixed milk (2 parts) and cream (one part testing 30 per cent. fat). Twenty cc per 100 lbs. milk and cream produced too high a color for most markets.

Composition of Gervais, Camembert, and Cream Cheese.

As a result of a number of tests made during the months of April, September, and October, we found the average composition of the three kinds of "Soft Cheese," of which we sell most, to be as follows:

Kind of Cheese.	Per cent. Fat in Cream for Cream Cheese.	Per cent. Water.	Per cent. total Solids.	Per cent. Fat in Cheese.
Cream	23.62	37.13	62.87	59.0
Gervais		49.78	50.21	35.4
Camembert (fresh)		59.45	40.58	20.5

Comments. It will be noticed that these cheese averaged from 37.1 to 59.4 per cent. moisture, and 40.5 to 62.8 per cent. total solids. The percentage of fat in the cheese ranged from 20.5 in the fresh Camembert to 59 per cent. in the cream cheese. These cheese are well suited for local trade and are profitable to make on the farm where conditions are favorable.

Devonshire Cream.

Devonshire Cream is a luxury very much enjoyed by some persons. The demand for this dairy product is somewhat limited and we have found it somewhat difficult to prepare a brand that had the smooth texture needed and which will keep in good condition a reasonable length of time. Several methods of preparing the cream were tried, of which the following are brief summaries:

1. Seventy pounds of new milk were set in a small cheese vat, having steam connections, and surrounded with cold water. At the end of twelve hours the milk and cream were heated with steam to 175°F. and afterwards cooled as low as possible and the cream removed. There were seven "pots" of cream, testing 58 per cent. fat. The skimmilk contained 1.8 per cent. fat. If these pots (5-oz. each) can be sold at 15c. each, wholesale, it would give a fair return for the milk, and the

skimmilk would be valuable feed for calves, or might be run through a cream separator to remove the remaining fat.

2. New milk was set, Oct. 5th, in a pan about seven inches deep, surrounded with cold water for twenty-four hours. It was then heated to 180F., afterwards cooled and part placed in glass jars and part in tins. The cream tested 51 per cent. fat and the skimmilk 2 per cent. fat. Oct. 6th, the flavor of the cream in both glass and tin was good, but lacked smoothness. On Oct. 13th both lots were acidy, and that in the tin was moldy. Both glass and tin were covered with well-fitted tops.

3. On Oct. 5th, a part of the same milk as used in No. 2 was separated in a cream separator at a temperature of 180°F., and the cream put directly, while warm, into glass and tin vessels, then cooled with lids on tightly. The cream contained 68 per cent. fat, and the skimmilk .04 per cent fat. Oct. 6th, flavor of cream in both glass and tin was good. Oct. 13th, flavor slightly off in both glass and tin.

4. New milk (similar to previous tests) was separated by means of a cream separator, at a temperature of 100F. The cream was then heated to 180F. and placed while hot in glass and tin vessels, covered tightly and cooled. Cream tested 66 per cent. fat and skimmilk .09 per cent. fat. Oct. 6th the flavor of cream in both glass and tin was good. Oct. 13th, the flavor was slightly off in tin, but good in glass jar.

All these lots were made from fresh morning's milk on Oct. 5th, and were all kept in a small house refrigerator at about 43 to 50°F.

5. New Pasteurized milk was separated on Oct. 23rd at a temperature of 170°F. and the cream bottled in glass jars while hot. The jars had screw tops and were placed in a small refrigerator at a temperature of 43 to 50°F. The cream tested 66 per cent. fat. Five jars holding about 5 ounces each were filled and set in the refrigerator to test the keeping quality, none being opened until tested on the following dates.

October 25th—Flavor good, nice smooth condition.

October 27th—Flavor good, nice smooth condition.

October 30th—Flavor slightly off, nice smooth condition.

November 2nd—Flavor good, nice smooth condition.

The results indicate that a good quality of Devonshire Cream can be made either by separating the milk with a cream separator, having the temperature of the milk 170 to 180°F., or the milk may be separated at the ordinary temperature of about 100°F., and the cream only afterwards heated to 170 or 180°F. It may then be bottled while hot, covered, and be set in a refrigerator to cool. This cream should test 50 to 60 per cent. fat, and will keep in a good condition for a week or ten days. The advantage of this plan over the ordinary method of setting the milk for the cream to rise, then "scalding" milk and cream, is that there is much less loss of fat in the skimmilk.

MILK AND CREAM TESTING EXPERIMENTS, 1911.

Paper Milk Bottles.

The ordinary glass milk bottle commonly used for delivering milk in towns and cities, has many good features, but has some objectionable ones, among which may be mentioned: they are easily broken, easily lost, are a heavy load to carry,

and if not properly washed and sterilized, may be the means of spreading contagious disease. A substitute for glass, as a milk container, has recently been placed on the market in the form of a "mono-service" paper bottle, sterilized and coated on the inside with paraffine wax.

During the season of 1911 a number of tests were made, in the Dairy Department of the College, comparing these single service paper bottles with a glass bottle, for holding milk. The main points observed were with reference to the effect upon flavor, acidity, and general good qualities of the milk at the end of 24 and 48 hours. The milk was first pasteurized at a temperature of 165 to 170°F., then cooled to about 58°, when the milk was placed in the various packages, and allowed to stand in a room where the temperature averaged 56°F.

There was little difference in the milk of the various containers as to temperature or acidity, but some of the paper packages imparted a package flavor to the milk after standing in them for about 24 hours. One or two of the mono-service bottles gave good results and compared quite favorably with the milk in glass bottles. If these packages can be put on the market in Canada at a reasonable price, we see no reason why they may not displace the ordinary glass bottle as a container for retail milk and cream. So far as we know, this package is not made in Canada at present.

The advantages of the mono-service milk bottle over the glass bottle are: It is lighter, as a quart size paper bottle weighs a little over one ounce, whereas the pint glass bottle weighs one pound, or is sixteen times heavier; there is no danger of spreading contagious disease, as the bottles are used once and destroyed: there is no loss to the milk dealer, by customers failing to return the bottles, which loss is a heavy item of expense in the milk business, and if it can be reduced, ought to result in cheaper milk to the consumer.

So far as we can see, the single service milk bottle ought to prove a great help in solving some of the many perplexing problems of the town and city milk trade. The matter is of sufficient importance to warrant a thorough investigation of the possibilities of replacing the present glass bottle with something more nearly an ideal package. We have tried to interest both Canadian and American manufacturers in placing these bottles on the Canadian market at a reasonable price, and feel confident that this will soon be accomplished.

Weighing vs. Measuring Cream Samples for Babcock Test.

There is always more difficulty in testing cream for fat, accurately, with the Babcock test, than is the case with milk, because the cream is more viscous, hence more difficult to sample correctly, and because of the less specific gravity of cream. A 17.6 cc pipette, which is the volume of milk for a Babcock test, will not deliver 18 grams of cream into the test bottle. Also any errors in testing cream are much more important than with milk, because of its relatively high fat content.

Many are the devices and plans which have been suggested from time to time to overcome the difficulties in testing cream. Among these, three stand out prominently:

1. The use of an 18cc pipette.
2. Weighing 9 or 18 grams of cream into a test bottle.
3. Modifications in the form of the test bottle, such as longer neck with finer readings, etc.

Some argue that a pipette should never be used when testing cream and that nothing but a scale or balance ought to be tolerated. Theoretically this

is true, but in practice there are many difficulties in the way of using a scale or balance. It requires more time to test samples by means of a scale as compared with a pipette. Many of these scales are no more accurate than an 18cc pipette, for cream testing up to 25 or 30 per cent. fat, the specific gravity of which is practically 1— the same as water, therefore 18cc of such cream, for all practical purposes, weighs 18 grams, but care should be taken to rinse the pipette, so that all the cream will be transferred to the test bottle.

During the past season fifteen tests were made by comparing results obtained from testing cream containing from 16.5 to 50 per cent. fat. Samples of each lot were measured, weighed, pipette rinsed and not rinsed, 18 and 9 gram test bottles were used. The regular cream bottle was an ordinary six inch bottle reading up to 50 per cent. fat. The 9 gram bottles are a special cream test bottle recently placed on the market. The results are shown in the table:

TESTING CREAM FOR FAT.

Comparison of readings got by using 18cc, 18 grams, and 9 grams, samples.

Date.	% Acidity of Cream.	18 grams, 50% bottle.	18cc. 50% bottle pipette not rinsed.	50% bottle, 18cc pipette rinsed with water.	9 grams, Wagner bottle.	9 grams, Mitchell bottle.	Remarks.
May 15.....	.63	31%	29.5%	30.5%	31.25%	31%	Cream very sour. Full of air and gas.
May 22.....	.58	27.5	26.5	27	27.5	27.5	Cream sour and smooth.
May 23.....	.31	32.5	31	32	32.5	33	
May 29.....	.49	22	20.5	21	22	22	
Aug. 10.....	.42	38.5	36	37	39.5	40	
Aug. 12.....	.47	36.5	30.5	31	35.5	36.5	Air and gas bubbles in cream.
Aug. 14.....	.47	33	30.5	31.5	32.5	33	
Aug. 18.....	.44	34	32.5	34	34.5	35	
Aug. 19.....	.15	46	43.5	44.5	46.5	46	Sweet cream.
Aug. 21.....	.38	46	41	44.5	46	46	Same cream as above after souring.
Sept. 7	.....	16.5	16.5	16.5	16.5	16.5	Sweet cream in good condition.
Oct. 3	.....	21	20.5	21	21	21.5	Sweet.
Oct. 5	.5	20	16.5	17.5	20	20	Sour but smooth.
Oct. 31	.....	24.5	23	24	24.5	24.5	Composite sample.
Oct. 31	.....	50	44	45.5	50	50	Composite sample.
Ave. 15 tests	.....	31.9	29.4	30.5	31.9	32.1	

Conclusions.

1. The tests were usually lowest by measuring with an 18cc pipette, more particularly was this the case when the pipette was not rinsed. In those samples of cream testing under 30 per cent fat, the results are similar to those obtained by weighing 18 grams of cream into a test bottle. Averaging the fifteen trials, we find the 18cc pipette samples not rinsed were 2.5 per cent. lower than the readings of the 18 gram samples, while the rinsed pipette lots were 1.4 per cent. lower.

2. The 9 gram Wagner bottles gave an average percentage reading the same as was obtained from the 18 gram samples, although there was a difference of from one-half to one per cent. on individual tests.

3. The Mitchell 9 gram bottles tended to give slightly higher readings ings than did any of the other methods tested, the average being .2 per cent. higher than from the 18 gram samples.

4. Wherever practicable, we should advise the use of a sensitive balance, the 12-bottle form being convenient for creamery use, but where none of the cream tests over 25 to 30 per cent fat, no serious error will result by using an 18cc pipette, *if care be taken to rinse all the cream from the pipette into the test bottle.*

Comparison of Cream Scales for Testing.

In the dairy laboratory we have three styles of cream scales, each holding twelve Babcock bottles for testing cream. The average percentage of fat obtained in the cream as the results of eight tests on cream varying in fat percentage from 19.5 to 46.5 were:

No. 1	No. 2	No. 3
29.75 per cent.	29.625 per cent.	29.75 per cent.

Bottles reading up to 50 per cent. fat were used for the tests. In most cases the readings from all these scales were the same. In a few cases the difference was one-half of one per cent. which is within the "limits of error." So far as these results are concerned, they indicate that all three forms of balance will give accurate results, if properly used. Two of the Cream scales have "agate bearings" and the other works on the "Torsion" principle.

Comparison of First and Twelfth Bottles on a Twelve Bottle Cream Scale.

Five tests were made comparing weights of cream and percentages of fat in the *first* and the *twelfth* bottle, with three forms of twelve bottle cream scales. The Babcock bottles were first balanced on each cream scale, then weighed on a sensitive balance, then cream was added to balance the 18 gram weight, and again weighed on a fine balance. The bottles of cream were tested in the usual way with the following results:

1st bottle.		12th bottle.	
Average weight of cream in bottle.	Average per cent. Fat.	Average weight of cream in bottle.	Average per cent. Fat.
18.089 Grams	28	18.028 Grams.	28

So far as these results are concerned, they indicate that the results are practically the same and correct for the twelfth bottle as compared with the first bottle weighed on a twelve bottle cream scale used for weighing 18 grams in a Babcock test. It was thought that possibly the twelfth bottle might require more than 18 grams of cream in order to balance the weight after the scale was loaded with 11 bottles, which might reduce its sensitiveness. The tests of the cream varied from 19.5 to 39.5 per cent. fat and show that there was practically no difference in results obtained in the first and last, or twelfth bottle.

Comparison of Results from Each Bottle on a Twelve Bottle Cream Scale.

Seven tests were made with three kinds of 12 bottle cream scales used for weighing 18 grams of cream to test for fat in a Babcock Test. The range of percentages of fat in the creams tested was from 19.5 to 39.5. The averages of the results were:

No. of bottle.	Av. of fat in Cream. (7 tests.)	No. of bottle.	Av. of fat in Cream. (7 tests.)
	%		%
1.....	32.107	7.....	32.142
2.....	32.035	8.....	32.071
3.....	32.107	9.....	32.000
4.....	32.314	10.....	32.071
5.....	32.071	11.....	32.000
6.....	32.000	12.....	32.075

These results indicate that a sample of cream will likely be tested accurately, or at least within about .2 per cent. of accuracy, no matter what the number of the bottle as weighed on a twelve bottle cream scale. The greatest average variation is .214 per cent. between the highest test (in the fourth bottle weighed), and, in this case, the lowest test, in the sixth, ninth and eleventh bottles.

CREAM SAMPLING AND TESTING.

Composite Samples Kept for One Month in Open and Closed Bottles at Low and Moderately High Temperatures.

The cream from three of our regular patrons was used for experiments in testing during the season of 1911. For the first series of tests an aliquot portion of 1cc. of cream for each pound of cream delivered by each of the three patrons was preserved by using our regular "stock" preservative (3 parts bichromate of potash and 1 part corrosive sublimate) in sample bottles, two of which were kept closed with glass stoppers during the month, and two were left open. One of each was kept at a temperature ranging from 34 to 48°F.; the other two were kept at ordinary room temperatures ranging from 60 to 90°F. The percentage of fat in the cream sampled ranged from 25 to 35. The condition of the samples kept at a low temperature were nearly always "good," a small amount of mould appearing on one patron's sample for each of the months of June and September. Those samples kept at ordinary room temperatures in both the open and closed bottles were frequently mouldy and difficult to sample.

The averages of the results on nineteen monthly samples of each method were as follows:

Samples kept at low temperature in stoppered bottle, 29.79 per cent. fat; open bottle, 30.5 per cent. fat.

Samples kept at high temperatures in stoppered bottle, 29.84 per cent. fat; open bottle, 32.47 per cent. fat.

Conclusions.

1. The sample kept in the tightly stoppered bottles averaged practically the same percentage of fat whether kept at low temperature or moderately warm temperature.

2. The samples kept in the open bottles tested higher than did those in the closed bottles, more particularly the ones kept in a warm room.

3. Samples for composite testing should be kept in closed bottles and be kept as cool as possible.

Proportional vs. Uniform (One Ounce) Sampling of Cream for Composite Testing of Fat.

It has been claimed that patrons delivering varying weights of cream containing varying percentages of fat ought to have samples taken in proportion to the weight of cream delivered, that "aliquot" sampling is the only correct plan. The cream from three patrons' deliveries were sampled by taking 1cc. of cream for each pound of cream delivered, and at the same time a sample was taken by using an ounce dipper taking the same volume from each delivery for the composite sample. The samples were preserved with our "stock" preservative in glass stoppered bottles, for the most part, and were kept at a moderately low temperature. Each sample was tested monthly for fat. The range of tests in the monthly composite samples was from 25 to 33 per cent. fat. Averaging the nineteen tests made by using an aliquot sampler at each delivery, we find it to be 29.8 per cent. fat. The average of the ounce sampling tests was 29.77—practically the same.

So far as these tests may be taken as indication of comparative results to be got by aliquot and uniform sampling for composite testing of cream, there would not seem to be any advantage in the aliquot method and it is considerable more labor. In no case was there more than half of one per cent. difference in the tests for fat of the two methods, and this is within the "limits of error."

Comparison of Various Preservatives Used in Composite Cream Samples.

Tests of two tablets forms of preservatives, formalin, Gillet's lye, and our regular stock preservative (3 parts potassium bi-chromate and 1 part bi-chloride of mercury) were made on samples from three patrons' cream during the season from April to October. One tablet was used in a pint sample: from ½ to 1cc. of formalin was used in a pint sample; Gillet's lye was used in the proportion of a lump about the size of a small bean on the first of the month, and a similar quantity on the 15th of each month, while of our "stock" preservative there was used what would lie on a five cent piece, or a little more, to preserve the sample for a month.

Practically all of these preservatives kept the samples in good condition for a month. Those samples preserved with formalin were inclined to be difficult to obtain a clear reading on the neck of the Babcock cream bottle. A few of the samples preserved with the tablets were mouldy. There was not much difference in the readings, or percentages of fat, in the samples preserved by each of the five methods, what differences there were would, in most cases, fall within the "limits of error." The formalin samples were inclined to vary most.

On the whole we have not found a better preservative for composite samples of cream or milk than the one used by us for a number of years, made up of about

three parts of bi-chromate of potash and one part corrosive sublimate. It is cheap, effective and not dangerous, as the samples are colored by the preservative.

Daily, Composite Weekly, Semi-Monthly, and Monthly Testing of Cream Deliveries.

Some of the Ontario creamerymen follow the plan of testing each and every delivery of cream for fat content and report each of the tests to the patrons at once. Others test weekly, some every two weeks, and others monthly, by the composite method. During the past season the cream as delivered to us by three patrons was tested daily, or at each delivery, weekly, semi-monthly, and monthly, in order to see what difference, if any, in the pounds of fat there would be credited by the four plans.

The daily samples were tested on the day the cream was delivered. The weekly composite samples were tested once a week during each month. The semi-monthly samples were tested on the 15th and last days of each month. The monthly composite samples were tested on the last day of each month. The composite samples were preserved with our "stock" preservative, and were kept in cork stoppered bottles in cold storage. The Babcock bottles used for testing were the ordinary six-inch cream bottles graduated to read up to 50 per cent. fat.

The main results of the tests are shown in the table:

Patron.	Range in weight of daily delivery of cream.	Range in per cent. fat—daily tests.	Month.	Pounds of fat credited by			
				Daily tests.	Weekly tests.	Semi-monthly.	Monthly tests.
	Lbs.	%		Lbs.	Lbs.	Lbs.	Lbs.
No. 1...	50.5 to 58	30 to 36.5	April...	89.569	88.392	88.172	89.265
No. 2...	15.5 to 29.5	26.5 to 35.5	April...	42.821	41.780	41.780	41.480
No. 1...	36.5 to 66.5	30.5 to 37	May....	154.255	150.150	151.810	154.110
No. 2...	17.5 to 66.5	26.5 to 30.5	May....	108.166	106.805	109.000	104.545
No. 3...	20 to 28	27 to 30.5	May....	48.346	48.004	47.787	47.180
No. 1...	43 to 67.5	31 to 36	June ...	150.059	149.217	146.895	149.325
No. 2...	23.5 to 58.5	22.5 to 35	June ...	120.498	120.412	117.705	121.945
No. 3...	13.5 to 22	24 to 30.5	June ...	67.327	69.350	67.055	68.150
No. 1...	33 to 61.5	30.75to 35	July....	125.449	126.536	126.635	127.317
No. 2...	8.5 to 36	19.5 to 34	July....	70.139	69.655	68.735	68.370
No. 3...	11.5 to 23.5	25 to 29.5	July....	48.381	49.029	47.635	46.987
No. 1...	38.5 to 58.5	31.5 to 39.5	Aug	126.201	126.286	124.315	122.442
No. 2...	12 to 26	21 to 30	Aug	61.559	61.682	61.082	61.082
No. 3...	13.5 to 20.5	23 to 27	Aug	33.816	34.807	33.990	32.462
No. 1...	32 to 51.5	31.5 to 37	Sept. ..	107.622	105.730	105.375	105.600
No. 2...	13 to 33.5	23.5 to 40	Sept. ..	58.040	58.825	56.890	60.175
No. 3...	6 to 13	27 to 30	Sept. ..	21.007	20.630	20.212	20.212
No. 1...	28 to 43	31.5 to 33	Oct.	73.812	74.697	74.877	75.200
No. 2...	15 to 25	29 to 39.5	Oct.	57.535	57.450	58.050	56.550
Total pounds credited during season.....				1564.602	1559.437	1548.000	1552.397

The total difference in pounds of fat credited these three patrons' deliveries for the season was 5.195 less on weekly composite tests, as compared with daily tests; 16.602 lbs. less by the semi-monthly, and 12.205 lbs. less by the monthly composite tests. All these may be considered within "the limits of error" on this weight of fat—1564.6 lbs. The error is less than one per cent. by the monthly composite plan, as compared with the results from daily testing. The saving in labor and expense by testing monthly as compared with daily testing is a large item in a creamery having 100 to 500 patrons.

CREAM AND BUTTER INVESTIGATIONS, 1911.

Methods of Caring for Cream on the Farm.

A great variety of methods in caring for cream sent to the creamery are found upon the various farms of the Province. The two most common vessels for holding the cream are, a tin can, or a crock of some sort; many farmers' wives being under the impression that a crock is much better than a can for holding cream.

The most common place for keeping the tin can or crock is on the floor of the cellar.

In order to get some facts upon these questions a number of tests were made during the months of June, July, August and September, by keeping cream in cans, glazed crocks, cracked and chipped crocks, cans and crocks covered and uncovered. The cellar of the house in which the Buttermaker of the Dairy, Mr. Rickwood, lives, which has a cement floor, and which compares with an average farm cellar, was used for the experiments. There was nothing in the cellar at the time of these tests. Windows were open. In all cases equal quantities of similar cream were kept under the conditions given, with the following results:—

Comparison of Well Glazed and Poorly Glazed Crock for Holding Cream.

	Glazed Crock.			Cracked Crock.		
Date.	Temp. of Cream.	Per cent. Acidity.	Remarks.	Temp. of Cream.	Per cent. Acid.	Remarks.
Put in Aug. 3	64°	.14	Crock covered.....	64	.14	Crock covered–
Taken out Aug. 5.	67°	.6	Cream in cellar 44 hrs. Very sour. Test of cream 26 per cent.; temp. of cellar 65°	67°	.61	Very sour, rank smell, old.
Put in Aug. 19.	62°	.12	Not covered.....	62°	.12	Not covered.
Taken out Aug. 21	60°	.53	Good flavor, clean. Cream in cellar 45 hrs. Temp. of cellar 59°; per cent. fat, 23.	60°	.54	Old flavor; rancid,
Put in Aug. 24.	55°	.12	Covered	55°	.12	Covered.
Taken out Aug. 26.	62°	.52	Good flavor; cream in cellar 45 hours: per cent. fat 28; temp. of cellar 59°.	62°	.54	Old flavor, bad aroma
Put in Sept. 4	95°	.14	Not covered	95	.14	Not covered.
Taken out Sept. 6.	63°	.57	Sour but clean in flavor: cream in cellar 52 hrs. Temp. of cellar 61; per cent. fat 30.	62°	.57	Old flavor, like damp earth.

Conclusions.

There was little or no difference in the temperature and acidity of the cream whether kept in a well glazed crock, or in one which was chipped and cracked, but the cream in the latter, in every case, had a bad aroma in from 44 to 52 hours after placing the cream in such a crock. The practical lesson to be learned is that such a crock should not be used for holding cream, as it is likely to spoil the flavor of the cream and also that of the butter.

Cooling *vs.* not Cooling Cream Before Placing in Cans and Crocks on a Cellar Floor.

Some patrons of creameries do not think it necessary to cool the cream before placing it in the cream can or crock, which is put on the cellar floor and there allowed to cool by the lower temperature of the surrounding air and cement floor. Four tests were made during August and September, comparing the cooling of cream with not cooling, before placing in the cellar, using a clean, bright tin can for one set, and a clean, well-glazed crock for the other set of experiments.

The cream was kept in the cellar from 44 to 52 hours, where the temperature of the air ranged from 59 to 61° F. The percentage of fat in the cream ranged from 23 to 30. In two of the sets of experiments the cans and crocks were covered and in the other two sets, they were left open.

The main points in the tests are shown in the table of results:

Date.	Cream cooled and placed in can in the cellar.			Cream warm and placed in can in the cellar.		
	Temp. of Cream.	Per cent. Acidity.	Remarks.	Temp. of Cream.	Per cent. Acid.	Remarks.
August 19	62°	.12	Covered.	98°	.12	Covered.
August 21	60°	.53	Fair flavor, 45 hours in cellar, 23 per cent. fat, temperature cellar 59°.	60°	.52	Tinny flavor.
August 24	55°	.12	Covered.	95°	.12	Covered.
August 26	62°	.51	Fair flavor, 45 hours in cellar, 28 per cent. fat, cellar temperature 59°.	62°	.54	Fishy.
August 26	58°	.13	Not covered.	97°	.13	Not covered.
August 28	61°	.5	Clean flavor, cream in cellar 44 hours, per cent. fat 25, temp. of cellar 59°	61°	.54	Very sour and thick.
September 4....	57°	.14	Not covered.	95°	.14	Not covered.
September 6....	63°	.56	Clean flavor, 52 hours in cellar, temp. 61°, per cent. fat in cream 30.	63°	.56	Clean flavor.

Date.	Cream cooled and placed in crock in the cellar.			Cream warm and placed in crock in the cellar.		
	Temp. of Cream.	Per cent. Acid.	Remarks.	Temp. of Cream.	Per cent. Acid.	Remarks.
August 19.....	62°	.12	Covered.	98°	.12	Covered.
August 21.....	60°	.52	Good, best of lot.	60	.54	Yeasty.
August 24.....	50°	.12	Covered.	95°	.12	Covered.
August 26.....	62°	.52	Good.	62°	.57	Old flavor.
August 26.....	58°	.13	Not covered.	97°	.13	Not covered.
August 28.....	60°	.5	Good, best of lots.	61°	.53	Clean, very sour.
September 4....	57°	.14	Not covered.	95°	.14	Not covered.
September 6....	63°	.55	Clean flavor.	63°	.57	Good flavor.

Conclusions.

1. All the lots in both cans and crocks, cooled and uncooled, covered and uncovered, were at practically the same temperature when the cream was removed from the cellar at the end of 44 to 52 hours.

2. Contrary to expectations, all lots had about the same percentage of acidity when taken from the cellar, the tendency being towards slightly higher acidity in the lots not cooled before placing them in the cellar.

3. The flavor of the lots cooled was rather better than from those not so cooled, while the lots in the crocks pre-cooled, as compared with similar cream in a can, gave best results in flavor. This corresponds with the impressions of farmers on this point.

4. So far as these tests show, there would not seem to be very much difference in results, whether cream be cooled or uncooled before placing in a can or crock, covered or not covered, in a reasonably clean, cool cellar. Further tests are needed.

Comparison of Can and Crock in Cellar.

	Can Open.			Can Covered.		
Date	Temp. of Cream.	% Acid.	Remarks.	Temp. of Cream.	% Acid.	Remarks.
June 26	64°	.14		64°	.14	
June 30	58°	.54	Clean flavor. Temp. cellar 60 to 66. Cream setting on cement floor. In cellar 90 hrs. Cream 22% fat and was pasteurized. Open can and crock had thick layer on top. Weather cool.	58°	.52	Bad aroma from can.
July 1 Noon.	64°	.13		64°	.13	
July 5 a.m.	66°	.6	Spots of mould on cream. 30% fat in cream. Weather exceedingly hot. In cellar about 90 hrs. Temp. of cellar 64° to 70°.	65°	.64	Clean flavor.
July 7 Noon.	94°	.14		94°	.14	
July 10 a.m.	66°	.63	Aroma of cured meat. Mould spots on cream. In cellar about 67 hrs. Temp. cellar 70° to 75°. All cream very sour.	66°	.62	Moisture on inside of can and cover. Some mould spots. Smell "stuffy."
July 19	58°	.14		58°	.15	
July 21	60°	.62	Clean flavor. In cellar 37 hrs. Temp. of cellar 65° to 70°.	60°	.59	Close smell.
Aug. 3	100°	.14		100°	.14	
Aug. 4	68°	.61	Very sour. Clean flavor. Cream in cellar 37 hrs. 26% fat. Temp. cellar 66°.	67°	.63	Clean flavor.

Covered and Open Can *vs.* Covered and Open Crock for Holding Cream in Cellar.

Ten experiments were made, during June (2), July (6), and August (2), comparing a clean, bright tin can, with a well-glazed clean crock for holding cream in an ordinary cellar, half the number, with can and crock open or uncovered, and the other half, having the can and crock covered by a granite-ware, close fitting cover. There has been considerable difference of opinion as to whether or not cream cans should be covered while in a cellar. In these tests there seemed to be a tendency for a "close," "stuffy" smell on the cream where the cans were covered. On July 7th, when cream was placed in a covered can and crock, moisture on the inside of both can and crock, as well as on the covers, was quite pronounced. On June 30th, when cream was pasteurized, (other dates cream not pasteurized) both the open can and crock cream had a "leathery" covering on top, although the weather was cool.

Comparison of Can and Crock in Cellar.

	Crock open.			Crock covered.		
Date.	Temp. of Cream.	Percent. Acid.	Remarks.	Temp. of cream.	Percent. Acid.	Remarks.
June 26.	64°	.14	.....	64°	.14	
June 30.	58°	.6	Clean flavor.....	58°	.64	Clean flavor.
July 1, noon..	64°	.13	.....	64°	.13	
July 5, a.m..	64°	.71	Small spots of mould....	64°	.64	Small spots of mould.
July 7, noon.	94°	.14	.....	94	.14	
July 10, a.m.	65°	.65	Aroma of cured meat. Mould on cream.	65°	.60	Moisture on inside of crock and cover. Mould spots on cream.
July 19.	58°	.14	.....	58°	.14	
July 21.	60°	.59	Clean	61°	.61	Clean flavor. Close smell
Aug. 3.	100°	.14	.....	100°	.14	
Aug. 4.	67°	.62	Clean flavor	66°	.62	Clean flavor.

Noticed a slight stuffy smell when covers were first removed from cans and crocks.

Conclusions.

1. As in the previous tests reported on, there was little difference in the temperature of the cream at the end of 32 to 90 hours, whether kept in can or crock, covered or uncovered, the tendency being towards a slightly lower temperature for the cream in crocks.

2. Comparing the acidity of the lots we find the average percentages of acid in the cream when removed from the cellar, as follows:

Open Can	Covered Can	Open Crock	Covered Crock
.60.	.598.	.634.	.622.

These results show very little difference in acid development, what there is, being in favor of lower acid, or sweeter cream in the lots kept in the can as compared with similar lots kept in a crock, and lower acid or sweeter cream from can and crock covered as compared with similar vessels uncovered. However, the difference on this point is so slight as to be negligible in practice.

3. The weight of evidence appears to be in favour of not covering the cream can or crock, *provided,* that the cellar air is pure and free from smell of vegetables, fruit, etc. Under these conditions it would be better to keep the can or crock covered.

Ordinary Milk Can *vs.* Wooden-jacketed Can for Collecting Cream.

Various plans have been tried, when collecting cream for the cream-gathering creamery, in order to protect the cream from heat and consequently over-development of acid and bad flavours while on the wagon of the cream hauler. In some cases, the cream of patrons at the beginning of a cream route is on the wagon nearly all day. In hot weather this usually means that the cream becomes very much heated and more or less spoiled before reaching the creamery. To overcome this difficulty some creameries use wooden tanks, lined with tin, in which there is sometimes a compartment for ice, and in some cases a block or two of ice may be put in the tank of cream to keep it cool, but this is a practice not to be recommended.

Covering cans with a wooden or other covering, has been tried in recent years with more or less success. The objection to this form of can is that it increases the load and reduces the space available on the cream wagon. They are also less convenient to handle and more expensive to purchase at the outset.

In order to see what difference in temperature and acidity of cream there would be by having cream in these two styles of can, we asked our driver to empty, as nearly as he could estimate, half the cream from each patron, on certain days, into an ordinary Milk Can and the other half into a Wooden-jacketed Cream Can. The result of tests on five days were as follows:

Ordinary Milk Can.						Wooden Jacketed Can.				
Date.	Temp. of cream when received at creamery.	% acidity when rec.	% fat in cream.	Lbs. cream.	Remarks.	Temp. of cream when received at creamery.	% acidity, when rec.	% fat in cream.	Lbs. cream.	—
June 28.....	64°F	.38	29.5	214	Weather cool. 66° to 68°	64°	.43	32.5	193	Gathered 3 times per week.
July 5.....	77°	.46	30.5	191	Very hot weather.	73°	.52	31.0	200	"
" 14.....	74°	.49	30.5	200	"	69°	.45	31.5	210	"
Aug. 10.....	79°	.60	31.5	212	"	74°	.57	30.5	204	Gathered twice per week.
" 17.....	74°	.56	32.0	246	.....	71°	.55	31.5	221	"
Averages ...	73.6°F	.498	30.8	213.6	.....	70.2°F	.504	31.4	205.6	.....

Conclusions.

It will be noticed that there was a slight variation in weights of cream and percentages of fat contained in the two lots each day, but they are near enough for a practical comparison of results. The cream in the wooden-jacketed can arrived at an average of 3.4° cooler than did the cream in a milk can, and had slightly less acidity, the difference in this point being being practically neglible. It is a question whether or not the jacketed can, under these conditions, pays for the extra expense in cost, and extra labour in hauling and handling the cream. About the only advantage in the jacketed can, as revealed in these tests, was the slightly lower temperature of the cream on arrival at the creamery. The wagon was not covered.

Cost of Pasteurization of Cream for Buttermaking.

One of the objections made by creamery-men to the system known as pasteurization, is the cost of heating and cooling the milk or cream. In order to obtain some data on the question of cost, one experiment was conducted in our Dairy Department, and four at the Guelph Creamery Company plant in the city, through the courtesy of Messrs. Stratton and Taylor. It was thought that conditions at the Guelph Creamery were more like good creamery conditions than those prevailing in our dairy, where the steam boiler is some distance from the pasteurizer.

The average cost, under the conditions given, is .032c per pound of butter, or a trifle over 3c per one hundred pounds of butter. This seems very low, but the work was done carefully and the charges are based on what are apparently fair estimates of cost, outside of labour, for which no charge was made.

In the experiments made at the creamery of the Guelph Creamery Co., live steam was used for heating, and the condensed steam was allowed to escape. Electric power was used, costing 1⅛c per kilo watt hour and also a charge of $6.50 per month for motor rent, etc., which is not reckoned, as most creamery men would probably own the motor. Coal is charged at $4.00 per ton, being about the cost of good steam coal. Water cost 10c. per 1,000 gallons. The boiler capacity is 30 h. p. In each case cream was cooled to the temperature at which it arrived at the creamery. Water and steam were used for washing cans during all these experiments.

RESULTS OF TESTS, SHOWING COST OF PASTEURIZING CREAM, 1911.

Date.	Coal used.		Water used for boiler and cooling.		Electric power.		Total cost of Pasteurizing.	Butter.	Average cost per lb. butter.	Remarks.
	Lbs.	Cost.	Gals.	Cost.	K.W.	Cost.				
Guelph Creamery—		Cts.		Cts.		Cts.	Cts.	Lbs.	Cts.	
April 27	73	14.7	1,690	16.9	4.25	4.8	36.4	876	.041	Cream delivered from pasteurizer into a century cream vat. Temperature of water 50°.
June 30	125	25.	2,240	22.4	4.60	5.2	52.6	1,605	.032	Cream delivered from pasteurizer into two century vats, half into each. Temperature of water 52°.
September 7	85	17.	1,110	11.1	3.20	3.6	31.7	1,210	.026	Cream cooled in century vats, half running into each vat. Time past. was 2 hours. Temperature cream in vats when finished past. was 69°. Temperature of water was 52°.
September 29	58	11.7	502	5.2	4.30	4.7	21.6	670	.032	Cream delivered into one century vat. Time past. 1 hour 55 min. Temperature cream in vat when finished past., 70°. Used no water to cool from 70° down to 60°, so that gals. water used are less. Ice not included. Temperature of water 52°.
O. A. C. Dairy—										
May 27	65	13.0	.....	.....	.....	.....	13.0	445	.029	Steam power used. Exhaust steam used for heating. Ran air compresser at the same time to pump water from well. Temperature of water 50°. Boiler capacity 60 H.P.

Pasteurized Skim Milk *vs.* Powdered Milk for Making Culture (starter) in Buttermaking.

At a cream gathering creamery it is frequently difficult to obtain skim-milk for the purpose of making a culture, commonly called "starter," to ripen the cream. It has been suggested that the buttermaker, under such conditions, should purchase a quantity of milk powder, which will keep an almost indefinite length of time, if kept dry and free from taints or odours. Whenever he desires to make a culture, he may use the milk powder as a basis for propagating and making the culture required. The milk powder should be dissolved in pure warm water, preferably pasteurized water, at the rate of about one pound of milk powder to one gallon of water.

The tests here reported were conducted by Mr. T. H. Lund, an undergraduate of the College, and Mr. Rickwood, our buttermaker. The butter was scored three times by experts. The average of all scorings in flavour for the lots made by using ordinary pasteurized skim milk for making the culture, was 40.8; the lots made from similar cream ripened with a culture made from powdered milk, scored 41.08, very little difference. The two lots made by using ordinary skim milk cultures lost 5.5 points in flavour, between May 20th and Oct. 7th, while the powderd milk culture lots lost 2.5 points.

So far as these tests show, they indicate that the powdered milk may be used satisfactorily in preparing cultures to ripen cream for buttermaking. The table gives the details:

Comparison of Skim Milk and Powdered Milk Cultures.

Date.	Lbs. cream.	Per cent. fat in cream.	Acidity of raw cream.	Kind of culture,	Weight of culture.	Acidity of culture.	Acidity of ripe cream.	Time churning.	Per cent. fat in B. milk.	Per cent. moist. in butter.	Salt in butter.	Lbs. butter.	No. of churning.
			%		lbs.	%	%	min.			%		
May. 10	530	28	.41	s. m.	33	.79	.51	18	.1	13.2	3.72	169	4. A
"	516	27.5	.41	p. m.	33	.83	.51	22	.11	13.	4.28	162	4. B
May. 13	400	27.5	.37	s. m.	30	.79	.54	39	.08	15.2	4.05	131	4. C
"	428	27	.37	p. m.	30	.79	.48	35	.08	15.4	3.02	136	4. D

Comments:—Numbers 4A and 4B were churned in a large "Success" churn. Could detect a slight taste of powdered milk flavour in butter-milk from 4B.

Numbers 4C and 4D were churned in a small "Simplex" churn. Could detect powdered milk flavour on butter-milk and butter of 4D.

SCORES OF BUTTER.

Date of scoring.	Number.	Flavor 50	Grain. 20	Color. 15	Salt. 10	Finish. 5	Total. 100
May 20.....	4 A	42.5	18.5	12.5	9	5	87.5
Aug. 21.....	4 A	40	18.5	13.5	10	5	87
Oct. 7.....	4 A	39.5	18.5	14	10	5	87
May 20.....	4 B	42.5	18.5	13	9	5	88
Aug. 21.....	4 B	41	18.5	13.5	10	5	88
Oct. 7.....	4 B	40.25	18	13.5	10	5	87
May 20.....	4 C	42.5	18.5	13.5	10	5	89.5
Aug. 21.....	4 C	40.5	18.5	13	10	5	87
Oct. 7.....	4 C	40	18.5	14	10	5	87.5
May 20.....	4 D	41.5	18.5	14.5	10	5	89.5
Aug. 21.....	4 D	40	18.5	13	10	5	86.5
Oct. 7.....	4 D	41	19	14	10	5	89

THE EFFECT OF NEUTRALIZING THE ACID IN OVERRIPE CREAM FOR BUTTER-MAKING. CREAM PASTEURIZED.

It is customary in some creameries known as "Centralizers," to neutralize the excessive acid which is found in cream delivered but once or twice a week during hot weather, then pasteurize and ripen with a pure culture or "starter." In order to obtain some data on the effects of various neutralizers, five experiments were conducted in August and September, testing the effects of Baking Soda, Washing Soda, Lime Water and Milk-lime when added to sour cream before pasteurizing.

NEUTRALIZED ACID IN CREAM.

Date of exp.	Lbs. cream.	% Fat in cream.	% Acid in raw cream.	Past. temp.	Churning temp.	Culture added.	% Acid of ripe cream.	Min. churning.	% Fat in B. milk.	% Moisture in butter.	% Salt added to butter.	% Salt in finished butter.	Lbs. butter.	Churn number.
Aug. 25....	285	28.5	.5	175°	52°	5%	.52	56	.36	14.8	5	3.3	99	59
,, 25....	237	27.5	.27	175°	52°	5	.24	37	.28	14.3	5	3.4	75	60
Sept. 6....	262	28	.55	175°	54°	6	.6	16	.4	14	5	2.65	84	61
,, 6....	251	27.5	.3	175°	54°	6	.46	20	.3	14	5	3.5	73	62
,, 9....	337	30.5	.48	175°	52°	5	.5	44	.34	15	5	3.2	121	63
,, 9....	275	27	.29	175°	52°	6	.36	33	.15	14.8	5	3.65	88	64
,, 13....	336	29	.5	175°	52°	4	.5	47	.33	14	5	3	111	65
,, 13....	296	28	.23	175°	54°	5	.28	30	.39	14.6	5	3.35	94	66
,, 16....	279	28.5	.37	170°	55°	5	.45	.....	.22	13.6	5	2.5	94	67
,, 16....	313	27.5	.37	170°	55°	5	.39	.....	.22	14.3	5	2.9	103	68

The experiment on September 16th did not have a control sample, but one (No. 67) was made by adding lime-water to the cream *after* pasteurizing, while No. 68 had lime-water added before pasteurizing. In all the others the odd numbers (59, 61, 63, and 65) were normal, while the even numbers (60, 62, 64, 66, also 67, 28) had a neutralizer added to the cream, in all cases, except in 67, *before pasteurizing.*

Notes.

In No. 60, used 1 lb. Sodium Bicarbonate (Baking Soda) in cream before pasteurizing, reducing acidity from .5 to .27 per cent., but after the cream was pasteurized there was only .1 per cent. acidity in the cream.

In No. 62, used 1 lb. Sodium Carbonate (Washing Soda) in cream before pasteurizing, reducing acidity from .55 to .3. After pasteurizing, the cream showed an acidity of .24. Held cream over night at 56°. A thick caseous layer formed on the surface of cream which could not be stirred in again, and quite a loss resulted. Overrun in No. 62 was but 5 per cent.

In No. 64, used 15 lbs. of a saturated solution of lime water in the cream before pasteurizing, which reduced the acidity from .48 to .29 per cent. After pasteurizing, the acidity was .2 per cent.

In No. 66, to the cream was added 2¼ lbs. lime milk (made by using 1 lb. lime in 2 lbs. water) before pasteurizing, which reduced the acidity from .5 to .23 per cent. After pasteurizing, it was almost neutral, having but .03 per cent. acid. The cream running over the cooler was quite thick. There was a smell of ammonia gas arising with the heat from the top of the cooler. More lime was noticed in the bottom of the Babcock bottle when the buttermilk was tested for fat.

In No. 67, used 9 lbs. lime water *after* pasteurizing to reduce acidity from .37 to .27 per cent.

In No. 68, used 19 lbs. lime water *before* pasteurizing to reduce acidity from .37 to .27 per cent. After pasteurizing, acidity was .23 per cent. Used more H_2SO_4 than usual in testing buttermilk from these churnings.

Scores of the Butter.

Date.	No. of churning.	Flavor 50	Grain 20	Color 15	Salt 10	Package 5	Total 100	Remarks.
Sept. 9..	59	41.5	18.5	14	10	5	89	Dead color.
Oct. 7...	59	40.5	18	14.5	10	5	88	Greasy.
Sept. 9..	60	41	17.5	13.5	10	5	87	Very greasy; flat flavor.
Oct. 7...	60	40	18	14	10	5	87	Peculiar flavor; greasy, gritty.
Sept. 9..	61	41.5	17	14.5	10	5	88	Weak body.
Oct. 9...	61	38	19	14.5	10	5	86.5	Better flavor.
Sept. 9..	62	42	18	14.5	10	5	89.5	
Oct. 7..	62	37.5	18.5	14.5	10	5	85.5	Peculiar rancid, mouldy taste.
Sept. 9..	63	42.5	18.5	14.5	10	5	90.5	Slightly gritty.
Oct. 7...	63	38	18	14	10	5	86	Greasy.
Sept. 9..	64	42.5	18	14.5	10	5	90.0	
Oct. 7..	64	41	19	14.5	10	5	89.5	
" 7..	65	40	18.5	14.5	10	5	88	Greasy.
" 21..	65	40	18	14	10	5	87	"
" 7..	66	40	18.5	14	10	5	87.5	Sharp after taste.
" 21..	66	40.5	18.5	14	10	5	88	Greasy.
" 7..	67	41	18.5	14.5	10	5	89	Flat flavor.
" 21..	67	40	18.5	14	10	5	87.5	
" 7..	68	40.5	18	14.5	10	5	88	Bad after taste; greasy.
" 21..	68	39.5	18	14	10	5	86.5	

Comments on Results.

1. The addition of the "neutralizer" had the effect of lowering the percentage of acidity in the cream to quite a marked degree. Pasteurization of the cream had a further effect of reducing the acidity, probably due to a more perfect chemical action as a result of the process of heating, although pasteurization alone reduces the acidity of cream to a slight extent. This latter effect is probably caused by a freeing of some of the natural lime salts of milk, by the action of

heat. The acidity did not seem to develop afterwards on the neutralized cream to the same degree as in the normal lots pasteurized and ripened with a similar percentage of culture.

2. In all cases, except the one where washing soda was used, the cream churned in less time after partial neutralization of the acid before pasteurizing. To some extent this may have been due to less weight of cream in the churn for these lots. There was also a tendency for less loss of fat in the buttermilk from these lots, as compared with the normal lots.

3. There was a little difference in the percentage of moisture and salt in the finished butter from the various lots.

4. The "overrun" was less in the lots where the cream was neutralized, as compared with the "overrun" from similar lots not neutralized. In the four tests which are comparable, the average "overrun" in the normal lots was 16.9 per cent. while the others averaged 13.2 per cent. The tendency was for a lower yield of butter in the lots where the cream was neutralized before pasteurizing.

5. There was little or no difference in the average scores for flavor, or in the total scores of the four lots.

6. The results by neutralizing with lime water before and after pasteurization of the cream were not decisive. More experiments on all these points are needed before drawing conclusions.

Pasteurizing Cream at Temperature of 120°F. to 175°F. vs. Raw Cream.

At various times during the past sixteen years we have conducted experiments, comparing pasteurized cream with unpasteurized or "raw" cream for butter-making. We have also made a large number of tests by heating cream to various temperatures between 120° and 185°F. in order to ascertain the effects of low and high temperature, on losses of fat in buttermilk, and upon the quality of the butter. New and varying conditions make it necessary to repeat these tests from time to time.

During the past year, twelve experiments were made comparing raw cream churnings with churnings of similar cream heated to 120°, 140°, 160° and 175°F. The cream was that delivered to us in the regular way from farmers living in the vicinity of the college. It was collected two or three times a week according to the season. Butter was scored when fresh and again when one month old.

The chief results are shown in the table:

No. of experiments.	Lbs. cream used.	% acid in cream when delivered	Past. Temp.	% fat in cream.	Minutes churning.	% fat in B. milk.	% overrun.	Av.score of butter (100)
2	533	.38	120°F.	25.75	34	.29	19.5	88.36
2	586	.38	Raw.	26.50	40	.21	19.75	88.12
3	1,037	.386	140°F	27.7	35.7	.187	17.6	87.74
3	1,035	.396	Raw.	27.5	44	.175	18.1	87.57
4	1,540	.41	160°F	27.7	21.5	.22	16.87	88.16
4	1,479	.41	Raw.	26.6	23.5	.21	17.55	88.36
3	1,147	.31	175°F	28.3	25	.189	17.1	89.39
3	1,060	.31	Raw.	27.5	25	.216	17.9	88.53

Comments on Results.

1. The pasteurized cream, churned at the same temperature, in less time, in all of the comparative tests with raw cream, except at 175° F., where the average time for churning was the same for the pasteurized and raw lots.

2. There was not much difference in the percentage of fat in the buttermilks from the various lots, what difference there was being in favor of the raw cream lots.

3. The percentage of overrun was slightly in favor of the unpasteurized lots.

4. There was not much difference in the quality of the butter except in the lots heated at 175°F. which scored an average of nearly one point higher as compared with lots made from similar cream churned raw.

Effects of Increased Acidity at the Time of Pasteurization.

Twelve experiments were made to determine the effect of acidity on the cream at the time of pasteurization, more particularly on the loss of fat in the buttermilk and on the quality of butter produced.

The cream was divided into three classes: 1. That arriving with an acidity of less than .2 per cent. 2. That above .2 and under .3 per cent. acid. 3. That having more than .3 per cent. acid on arrival at the creamery. There were three lots in the first, five in the second, and four in the third class. Each lot was divided on arrival, into two nearly equal parts, one-half of which was pasteurized at once, by heating to 164° to 170° F; the other half of each lot was ripened to an average of .373 per cent. acid in the first class; .364 for the second class; and .432 for the third class before pasteurizing at similar temperatures to those used in the unripened duplicates.

The main points in the results are shown in the table:

Class.	% acid in cream at time of pasteurizing	% fat in cream.	% fat in B. milk.	Average score of butter.				
				Flavor.	Grain.	Color.	Salt.	Total.
				(50)	(20)	(15)	(10)	(100)
1. Cream with less than .2 per cent. acid when delivered.....	.176	28.5	.21	41.91	18.16	14.24	10	89.33
	.373	26.5	.32	41.24	17.91	14.00	10	88.15
2. Cream with over, .2 and less than .3 per cent. acid when delivered..	.248	28.1	.21	41.10	18.0	14.15	10	88.25
	.364	27.9	.30	41.05	18.1	14.20	10	88.35
3. Cream having over .3 per cent. acid at time of delivering.....	.335	28.1	.275	41.10	18.50	14.06	10	88.66
	.432	27.5	.312	41.06	18.12	13.81	10	87.87

Conclusions.

1. An increase in the percentage of acid at the time of pasteurizing the cream caused an increased loss of fat in the buttermilk.

2. There was not much difference in the quality of the butter as indicated by the average scores. The lots made from cream pasteurized with less than .2 per cent. of acid, scored highest in flavor and in total score, of any of the lots. This fact points to the advisibility of having the cream as sweet as possible when pasteurizing, for the best results.

Salt in Butter Preservatives.

It is becoming customary to use preservatives other than salt in the butter at a number of Ontario creameries. The salt in the butter is also tested by the creamery instructors and to some extent by butter-makers. In order to ascertain whether or not these preservatives contained salt and how much error, if any, would be introduced in the salt tests, where preservatives were used in the butter, a number of preservatives were tested with the following results:

No. 1.	15	per	cent.	Sodium	chloride	(Salt)
No. 2.	18	"	"	"	"	"
No. 3.	19	"	"	"	"	"
No. 4.	38	"	"	"	"	"
No. 5	36	"	"	"	"	"

These tests indicate that the ordinary butter preservatives probably contain from 15 to 38 per cent of common salt and that when added to the butter they introduce an error in the salt test.

Comparing an English and a Canadian Brand of Salt for Buttermaking.

A firm in England requested us to make a comparison of their brand of salt, which they are introducing to buttermakers in Canada, with a Canadian brand of butter salt. Samples of each were sent to the Chemical Laboratory of the College for analysis, more particularly for the lime content. The English salt contained .01 per cent. lime and the Canadian salt contained .2 per cent. lime. During August and September, six comparative tests were made by churning from 229 to 316 lbs. pasteurized cream, testing from 28.5 to 30 per cent. fat, in a Simplex churn. The butter from one churning was salted with the English salt at a rate of 5 to 6 per cent. The other churning of each test was salted at similar rates with Canadian salt. The yields of butter and percentages of moisture in the butter was similar for both salts. The average of five tests for salt retained in the butter was 3.48 per cent. in the English salt, and 3.7 per cent. for the Canadian salt. All these butters were scored twice by Mr. Fred Dean, creamery instructor. When the scores were averaged, there was little or no difference in the quality of butter made from these two brands of salt.

Conditions Affecting the Salt and Moisture Retained by Butter.

In order to ascertain the effects of having the butter in different sized granules at the time of adding the salt, and also to note the effects of different methods of working and draining, on the percentage of moisture and salt retained by the finished butter, seventeen experiments were made. The chief points in the results are summarized in the table:

No. of Experiments.	Condition of Butter at time salt was added.	Method of working Butter.	Lbs. of Butter made.	Per cent. moisture in Butter.	Average % Salt.	
					Added.	Retained.
					%	%
4	Wheat and corn granules.	Continuous 15 revolutions of worker.	520	14.92	5	3.11
6	Large lumps—size of apples.	Continuous 15 revolutions of workers.	1,118	14.40	5	3.94
3	Wheat grains.	Dry salt added, then worked 10 rev. Allowed to stand 15 min., then 5 rev. of worker.	255	14.30	5	2.86
3	Wheat grains.	Wet salt added, then worked same as pre-previous lots.	257	15.50	5	3.15
1	297 lbs.—size of peas and corn, then washed to size of hickory nuts. 13.5% moisture.	(*a*) 100 lbs. worked 15 rev. continuously in simplex churn.	100	13.00	5	4.2
		(*b*) 100 lbs. worked in simplex churn after draining 45 minutes.	100	14.00	5	4.25
		(*c*) 97 lbs. worked in simplex churn after draining 1½ hour.	97	12.90	5	3.30

Comments on Results.

1. The butter churned to the size of wheat and corn granules retained more moisture and less salt, as compared with similar butters churned to the size of apples.

2. Salt applied in wet form (2 lbs. water to 5 lbs salt) caused a higher percentage of both moisture and salt to be retained in the finished butter.

3. In the case of a churning of 297 lbs butter, one hundred pounds of which was removed from the large churn to a smaller one, salted at the rate of 5 per cent and worked at once, the finished butter contained 13 per cent moisture and 4.2 per cent salt. A lot of 100 lbs. removed after draining for three quarters of an hour, then salted and worked, contained more moisture, and practically the same percentage of salt as in the previous lot. The remaining 97 lbs., after draining for one and a half hours in the large churn, then salted and worked, contained practically the same percentage of moisture as did the first lot, but had nearly one per cent. less salt than did the two previous lots. These results are somewhat contradictory. Further tests are needed before drawing conclusions.

CASEIN AND CHEESE INVESTIGATIONS, 1911.

Casein and Fat in the Milk of Nine Cows, Representatives of Three Dairy Breeds, from Nov. 16th, 1910, to Nov. 15th, 1911.

On May 1st, 1908, nine cows, representing three dairy breeds—Ayrshire, Holstein, and Jersey, three of each—were selected for an experiment to ascertain the production of milk, casein, and milk-fat in the milk of these cows for a series of years. Of the nine cows originally started in the test, all three of the Holsteins, two of the Ayrshires, (Nos. 66 and 136) and one Jersey (No. 131), completed the test on Nov. 15th, 1911. Other cows were substituted in the place of those dropped.

No. 76. HOLSTEIN, age 11 years. Freshened June 3rd, 1910 and June 25th, 1911	Days milking.	Lbs. Milk.	Lbs. Fat.	Lbs. Casein.
November, 1910	15	563	21.503	14.141
December, 1910	31	1,208	40.828	28.338
January, 1911	31	1,162	40.671	30.368
February, "	28	733	25.138	20.486
March, "	19	91	3.367	3.171
April, "	.....	.....	.....	.....
May, "	.....	.....	.....	.....
June, "	5	240	7.44	4.32
July, "	31	1,504	46.399	28.449
August, "	31	1,395	44.380	27.058
September "	30	1,205	40.989	27.476
October "	31	1,135	37.766	26.875
November "	15	582	19.644	13.278
Totals	267	9,818	328.125	223.960
Average per cent	.....	.....	3.34	2.28
No. 111. HOLSTEIN, age 6 years. Freshened Nov. 11, 1910.				
November, 1910	15	672	25.872	16.128
December, "	31	1,495	50.734	32.204
January, 1911	31	1,375	54.907	33.305
February, "	28	1,061	37.486	24.019
March, "	31	1,097	38.186	23.001
April, "	30	1,037	33.391	22.200
May, "	31	1,018	31.452	21.171
June, "	30	955	30.934	20.460
July "	31	924	30.620	18.900
August, "	31	875	27.437	18.528
September, "	30	737	24.887	18.876
October, "	31	667	23.653	17.615
November, "	15	294	10.276	8.022
Totals	365	12.207	419.853	274.429
Average per cent	.....	.....	3.43	2.44
No. 128. Holstein, age 10 years. Freshened Nov. 14th, 1910.				
November, 1910	15	660	24.924	17.820
December, "	31	1,337	51.254	32.102
January, 1911	31	1,251	45.501	31.712
February, "	28	1,051	37.731	24.904
March, "	31	1,083	40.887	24.360
April, "	30	1,001	35.415	21.204
May, "	31	908	31.421	20.516
June, "	30	890	31.797	22.848
July "	31	668	23.736	14.701
August, "	31	401	21.705	10.779
September, "	12	34	2.216	1.604
October, "	.....	.....	.....	.....
November, "	.....	.....	.....	.....
Totals	301	9,284	346.587	222.550
Average per cent	.....	.....	3.73	2.39
No. 66. Ayrshire, age 11 years. Freshened March 25th, 1910 and July 13th 1911.				
November, 1910	15	309	13.236	8.807
December, "	31	630	27.510	18.970
January, 1911	31	647	27.821	20.524
February, "	28	497	22.117	16.848
March, "	31	456	20.148	15.504
April "	30	197	9.914	8.628
May, "	.....	.....	.....	.....

No. 66. Ayrshire, age 11 years, etc. Continued.	Days milking.	Lbs. milk.	Lbs. fat.	Lbs. Casein.
June, 1911	.....	.....	.....	.....
July, "	18	530	23.106	14.254
August, "	31	839	30.018	18.046
September, "	30	642	23.452	15.144
October, "	31	690	25.000	17.058
November, "	15	382	13.899	10.459
Totals	291	5,819	236.221	165.242
Average per cent	.....	.....	4.04	2.83
No. 133. Ayrshire, aged 7 years. Freshened Sept. 24th, 1910.				
November, 1910	15	475	14.617	11.617
December, "	31	978	34.998	25.858
January, 1911	31	952	34.808	26.888
February, "	28	681	24.756	17.946
March, "	31	774	28.758	18.832
No. 118, age 5 years. Freshened Oct. 8th, 1910 and Sept. 29th, 1911.				
April, 1911	30	763	32.813	21.210
May, "	31	730	30.743	19.751
June, "	30	568	23.630	15.982
July, "	21	341	15.432	9.304
August "	.....	.....	.....	.....
September "	1	34	1,376	.828
October, "	31	990	41.034	28.364
November "	15	495	21.153	12.601
Totals	295	7,781	304.109	209.241
Average per cent	.....	.....	3.90	2.68
No. 133 was slaughtered. No. 118 takes her place.				
No. 136. Ayrshire, age 8 years. Freshened Sept. 2, 1910.				
November, 1910	15	498	22.338	14.071
December, "	31	985	43.852	28.924
January, 1911	31	894	41.122	26.432
February, "	28	736	33.060	22.565
March, "	31	811	36.694	22.235
April, "	30	689	30.837	19.972
May, "	31	695	29.202	20.016
June, "	30	725	28.797	20.007
July, "	31	690	28.117	17.649
August, "	31	658	27.195	17.764
September, "	30	552	25.701	17.849
October, "	31	481	23.828	17.692
November, "	15	246	11.922	8.31
Totals	365	8,660	382.665	253.486
Average per cent	.....	.....	4.41	2.92
No. 123 JERSEY. Aged 7 years. Freshened Sept. 21st., 1911.				
November. 1910	15	302	14.759	9.414
December, ,,	31	589	28.329	18.506
January, 1911	31	516	26.944	17.944
February, ,,	28	423	22.706	13.118
March, ,,	31	465	24.570	13.980
April, ,,	30	409	22.034	13.074
May, ,,	31	357	18.857	12.042
June, ,,	30	249	12.147	9.858
July, ,,	12	32	1.520	1.210
August, ,,	.....	.....	.....	.....
September, ,,	9	171	7.866	5.472
October, ,,	31	800	36.144	22.726
November, ,,	15	325	15.723	9.801
Totals	294	4,638	231,599	147.145
Average per cent	.....	.....	4.99	3.17

No. 131 Jersey. Aged 10 years. Freshened Jan. 24th, 1911,	Days Milking.	Lbs. Milk.	Lbs. Fat.	Lbs. Casein.
January, 1911	7	238	15.470	7.378
February, ,,	28	970	48.875	28.810
March, ,,	31	1,054	44,098	26.170
April, ,,	30	928	41,072	23.033
May, ,,	31	875	36.958	23.349
June, ,,	30	824	33.588	21.806
July, ,,	31	802	35.557	20.522
August, ,,	31	691	28.317	17.735
September, ,,	30	608	27.477	18.335
October, ,,	31	533	26.680	17.605
November, ,,	15	247	12.876	8.137
Totals	295	7,770	350.968	212.880
Average %	.....	.....	4.51	2.75
No. 138 Jersey. Aged 8 years. Freshened June 16th, 1910 and June 15th 1911.				
November, 1910	15	361	22.368	12.292
December, ,,	31	682	31.856	23.034
January, 1911	31	635	31.979	22.222
February, "	28	477	23.227	16.571
March, ,,	12	67	3.484	2.814
June, ,,	15	600	19.800	12.100
July, ,,	31	1,230	46.355	26.337
August, ,,	31	1,028	39.707	23.750
September, ,,	30	896	40.516	26.068
October, ,,	31	777	40.384	25.216
November, ,,	15	375	19.099	12.534
Totals	270	7,128	318.775	202.938
Average %	.....	.....	4.47	2.84

SUMMARY.

No. of Cow.	Days Milking.	Lbs. Milk.	Lbs. Fat.	Lbs. Casein
Holsteins —				
76	267	9,818	238.125	223.960
111	365	12,207	419.853	274.429
128	301	9,284	346.587	222.550
	933	31,309	1,004,565	720.939
Average %	.....	.....	3.20	2.30
Ayrshires—				
66	291	5,819	236.221	165.242
133 and 118	295	7,781	304.109	209.241
136	365	8,660	382.665	253.486
	951	22,260	922.995	627.969
Average %	.....	.....	4.14	2.82
Jerseys—				
123	294	4,638	231.599	147.145
131	295	7,770	350.968	212.880
138	270	7,128	381.775	202.938
	859	19,536	964.342	562.963
Average %	.....	.....	4.93	2.88
Total—9 Cows	2,743	73,105	2,891.902	1,911.871
Average	304	8,122.7	321.322	212.430
Average %	.....	.....	3.95	2.61

Comments on Results.

1. The three Ayrshires milked the greatest number of days, 951, followed by 933 days for the Holsteins, and 859 days for the Jerseys.

2. The Holsteins produced the greatest number of pounds of milk, milk-fat, and casein. The Ayrshires were second, in pounds of milk, and casein; the Jerseys were second in total number of pounds of milk-fat.

3. The Jerseys produced milk with the highest percentages of fat and casein, although the Ayrshires were a close second in the percentage of casein, the difference being only .06 per cent.

4. The average percentage of fat in the milk of the nine cows, was practically the same as last year, 3.95 as compared with 3.96 in 1910, but the average percentage of casein is higher for 1911, 2.61, as compared with 2.38 in 1910.

5. The Ayrshires produced 1.47 lbs. milk fat for each pound of casein in the milk.
The " " .68 " " casein " " " fat " " "
The Holsteins " 1.39 " " fat " " " casein " " "
The " " .71 " " casein " " " fat " " "
The Jerseys " 1.71 " " fat " " " casein " " "
The " " .58 " " casein " " " fat " " "

6. During the whole period of the test, May 1st, 1908, to Nov. 15th, 1911, (less three months in 1910) the three cows of each breed produced milk, casein and milk-fat as follows:

—	Lbs. Milk.	Lbs. Casein.	Lbs. Fat.	Average per cent.	
				Casein.	Fat.
Ayrshires	77,734	2,023.30	3,115.36	2.60	4.01
Holsteins	88,355	1,996.15	2,994.23	2.26	3.39
Jerseys	56,685	1,530.15	2,716.95	2.69	4.79

Cassein and Fat in Milk Delivered at Cheese Factories in Ontario.

The percentage of fat in the milk as delivered at the cheeseries of the Province has been a subject of investigation, more or less, during the past twenty years. As both fat and casein in milk are of great importance in the manufacture of cheese, and no data being available as to the casein content of factory milk, except the work done at the O. A College in connection with the herd milk and of the patrons sending milk to the Dairy Department of the College, it was decided to undertake some investigational work as to the casein and fat content in representative cheese factories in the Province of Ontario, both West and East. A 12 bottle Hart Casein Tester, sample bottles, chemicals, etc., were packed into a suitable box for transportation and Mr. P. A. B. Cherry, an undergraduate in dairying, was given charge of the work. Arrangements had been made previously with the owners, or makers, of the factories, to provide a place for the casein tester, and to allow the use of their Babcock Tester for fat determinations. We are indebted to the owners and makers at eleven factories, for their interest and co-operation in the work, and desire to express our appreciation of their assistance and co-operation. The following is the list of those co-operating.

Name of factory.	Owner or Maker's Name.	Post-office.	"Pay by Test"?	Number of Patrons.		
				Total.	No. Tested.	
					1st time.	2nd time.
W. ONTARIO.						
Caledonia	J. A. Hainer	Caledonia	Yes, fat + 2	90	46	45
Dominion	R. A. Thompson	Atwood	Yes, fat	105	46	46
Kerwood	W. Waddell	Kerwood	Yes, fat + 2	67	48	46
Mapleton	Jno. Brodie	Mapleton	No.	88	46	46
North Oxford	E. D. McKenzie	Ingersoll	No.	45 (Oct.)	48	43
Springford	R. Myrick	Springford	No.	76 to 56	46	.....
Springfield	H. Mannell	Springfield	.....	.....	23	.....
E. ONTARIO.						
Aberdeen	J. A. Ferguson	Caintown	No.	42	42	.....
Central Smith	J. McGregor	Peterboro	Yes, fat + 2	50 to 65	43	.....
Mountain View	J. A. Walker	Rossmore	No.	66	46	.....
Navan	M. Rothwell	Navan	Yes.	39	38	.....

It was estimated that Mr. Cherry would be able to run through about 48 samples for casein and fat determinations daily, and at the same time take composite samples from about ten patrons' milk for six days, then test these at the end of the week. The plan arranged, was for him to remain at each factory for a week, then go to another factory. Owing to the distances apart of the factories in Eastern Ontario, and the limited time at his disposal for the second round in Western Ontario, from four to five days at each factory was all the time available, at these places, otherwise the original plan was carried out. Altogether there were made 3,309 tests of whole milk for casein, and 3,290 tests of whole milk for fat in Western Ontario. 841 tests for casein and 832 tests for fat were made in Eastern Ontario, including the composite tests. Altogether there were made, over 8,000 tests for casein and fat at these factories. Those tests made in Western Ontario the second time, were largely of the same patrons' milk as was tested in the early part of the season. Altogether the milk from about 472 patrons was tested for both casein and fat. Of these about 226 were tested twice.

The work began at Kerwood in Western Ontario, on May 10th, and closed at Atwood, in the Listowel District, on Sept. 15th, 1911.

RESULTS.

From the mass of data gathered it is exceedingly difficult to extract that which is likely to be of the most benefit to the scientific and practical reader, without burdening the report with a great many details which have little scientific, or practical value, except as a means to arrive at conclusions. It may be advisable to publish more of the details in bulletin form after another year or two of investigational work. The policy which we have pursued in our experiments is to conduct all the important investigations from three to five years. By adopting this plan, our data is of more value and more reliable than if conclusions are drawn from one season's work only.

The season of 1911 was an exceptionally dry one, more particularly in Western Ontario, up to about the end of July. It is possible that this may have had some effect in causing what appears to be very low tests in both casein and fat at a

number of factories. For this reason it is advisable not to draw hard and fast conclusions from one season's investigations.

TABLE SHOWING HIGHEST, LOWEST, AND AVERAGE OF CASEIN AND FAT TESTS AT TEN CHEESERIES, SEASON 1911.

Name of Factory.	Dates of testing.	Per cent. Casein in Milk.					Per cent. Fat in Milk.		
		Single test.		Average of individual's test.					
		Highest.	Lowest.	Highest.	Lowest.	Av. of all.	Highest.	Lowest.	Av. of all.
WEST ONT. GROUP—									
Kerwood (1)	May 10–17	2.9	1.9	2.67	2.08	2.42	4.50	2.95	3.61
Kerwood (2)	Aug. 9–15	2.8	1.6	2.66	1.84	2.18	4.39	3.10	3.64
N. Oxford (1)	May 20–27	2.9	1.8	2.65	2.20	2.29	3.87	3.17	3.47
Ingersoll (2)	Aug. 17–22	2.4	1.8	2.25	1.92	2.06	4.02	3.09	3.50
Mapleton (1)	May 30 to June 5	2.9	2.0	2.64	2.11	2.37	3.64	3.01	3.38
Mapleton (2)	Aug. 24–29	2.7	1.9	2.41	2.02	2.23	3.88	2.95	3.47
Springford	June 7–14	2.7	1.9	2.57	1.97	2.32	3.87	2.70	3.18
Caledonia (1)	June 14–21	2.7	1.8	2.59	2.00	2.29	3.77	2.79	3.36
Caledonia (2)	Aug. 31 to Sept. 6	2.8	1.6	2.56	1.92	2.27	3.97	2.87	3.45
Dominion (1)	June 29 to July 3	2.4	1.9	2.34	1.99	2.15	3.58	2.96	3.22
Atwood (1)	Sept. 9–15	2.8	1.9	2.50	2.09	2.32	3.80	3.02	3.40
Average of West Ontario Group		2.72	1.82	2.53	2.01	2.26	3.93	2.96	3.42
EAST ONT. GROUP—									
Central Smith, Peterboro	July 8–12	2.4	1.7	2.24	1.86	2.05	3.97	2.85	3.29
Mountain View, Rossmore	July 13–19	2.5	1.7	2.31	1.89	2.13	3.99	2.60	3.40
Aberdeen, Caintown	July 21–26	2.6	1.8	2.40	1.85	2.12	4.22	3.36	3.64
Navan	July 29 to Aug. 3	2.7	1.6	2.46	1.92	2.12	4.34	3.18	3.69
Average of East Ontario Group		2.55	1.7	2.35	1.88	2.10	4.13	2.99	3.50
Average of Both Groups		2.68	1.79	2.48	1.97	2.22	3.98	2.97	3.44

VARIATION IN WEIGHTS OF MILK AND IN CASEIN AND FAT TESTS AT A CHEESE FACTORY IN WESTERN ONTARIO.

It has not been possible to give the detailed tests for weights of milk and percentages of casein and fat at the factories where testing was done during the past season, as such data would make too much bulk in the report, as already indicated. At one factory, not included in the general report on the casein and fat content of factory milks, the milk from morning and evening milkings was delivered separately, except for Sunday's milk, which was mixed and delivered on Monday morning. Saturday night's milk was also received from a number of patrons.

TABLE SHOWING WEIGHTS AND TESTS OF MORNING AND EVENING MILK, MONDAY A.M., AND SUNDAY MILK, JUNE 23RD, 24TH, 25TH, AND 26TH, AT SPRINGFIELD FACTORY, W. ONT.

No. of Patron.	Pounds of Milk.	Average per cent. Casein and Fat.			
		Morning.		Evening.	
		Casein.	Fat.	Casein.	Fat.
		%	%	%	%
1.	406	2.3	3.1	2.3	3.3
	400	2.4	2.9	2.3	2.8
	598	(2) 2.3	3.2	(2) 2.2	3.0
2.	463	2.3	3.2	2.2	2.8
	460	2.3	2.9	2.3	2.8
3.	243	2.4	3.2	2.3	3.1
	301	2.5	4.0	2.4	3.4
	437	(2) 2.2	3.2	(3) 2.	3.2
4.	385	2.3	3.7	2.4	3.7
	383	2.3	3.7	2.3	3.0
	188	.....	.....	(1) 2.4	3.2
5.	240	2.4	3.7	2.2	3.1
	240	2.5	3.9	2.4	3.1
	113	.....	.....	(1) 2.5	3.3
	336	(2) 2.3	3.4	(3) 2.2	2.7
6.	294	2.4	3.9	2.3	4.6
	286	2.4	3.6	2.3	2.9
	150	.....	.....	(1) 2.3	3.0
	447	(2) 2.4	3.6	(3) 2.3	3.3
7.	314	2.3	3.5	2.1	3.2
	320	2.5	3.6	2.3	3.0
	452	(2) 2.2	3.6	(3) 2.2	3.0
8.	510	2.3	2.4	2.3	3.0
	498	2.4	4.0	2.4	2.7
	741	(2) 2.4	3.4	(3) 2.3	3.2
9.	400	2.1	2.5	2.5	3.7
	392	2.2	2.7	2.3	3.1
	197	.....	.....	(1) 2.3	2.8
10.	382	2.5	3.7	2.3	3.0
	355	2.4	3.6	2.4	3.0
	181	.....	.....	(1) 2.4	3.1
	352	(2) 2.3	3.0	(3) 2.3	3.2
11.	338	2.2	3.2	2.1	2.9
	340	2.2	3.2	2.3	3.0
	500	(2) 2.2	3.1	(3) 2.3	3.1
12.	463	2.3	3.4	2.3	3.1
	470	2.4	3.4	2.6	4.2
	230	.....	.....	(1) 2.3	3.2
	697	(2) 2.2	3.2	(3) 2.4	3.1
13.	419	2.3	3.0	2.3	3.0
	413	2.4	3.3	2.4	3.1
	200	.....	.....	(1) 2.4	3.5
	587	(2) 2.3	3.3	(3) 2.4	3.5
14.	465	2.2	3.0	2.4	3.5
	453	2.4	3.4	2.3	2.9
	225	.....	.....	(1) 2.3	3.1
	646	(2) 2.5	2.9	(3) 2.4	3.2
15.	258	2.4	3.5	2.1	2.9
	250	.....	.....	2.4	3.1
	135	.....	.....	(1) 2.4	3.6
16.	270	2.4	3.3	2.2	3.0
	284	2.5	3.8	2.4	3.4
	120	.....	.....	(1) 2.6	3.9
	278	(2) 2.4	3.2	(3) 2.5	2.9
17.	232	2.2	3.0	1.9	3.0
	220	2.2	3.0	2.0	2.7
	110	.....	.....	(1) 2.2	2.8
	233	(2) 2.2	3.2	(3) 2.0	2.7
18.	210	2.3	3.4	2.2	2.9
	192	2.5	3.5	2.4	4.5
	108	.....	.....	(1) 2.5	3.6
	288	(2) 2.5	3.6	(3) 2.5	3.3
19.	469	2.1	3.1	2.0	2.9
	436	2.1	3.2	2.0	2.7
	668	(2) 2.2	3.2	(3) 2.1	3.2
20.	266	2.2	3.5	2.1	2.9
	250	2.2	3.2	2.3	3.8
	130	.....	.....	(1) 2.6	3.6
	388	(2) 2.1	2.9	.....	.....
21.	495	2.1	3.2	2.2	2.9
	506	2.1	2.9	2.1	3.1
	263	.....	.....	(1) 2.3	2.8
	765	(2) 2.1	3.1	2.2	3.1
22.	296	2.2	2.9	2.3	3.7
	308	2.1	2.9	2.4	4.4
	151	.....	.....	(1) 2.4	3.3
	445	(2) 1.9	2.9	(3) 2.3	4.4
23.	315	.....	2.9	.....	2.9
	270	2.3	3.4	.....	3.0
	170	.....	.....	(1) 2.5	3.0
	455	(2) 2.0	2.8	(3) 2.1	3.0

(1) Saturday night milk. (2) Monday a.m. milk. (3) Sunday's milk.

In order to show the difference in tests between morning and evening milks, and also for Saturday night's milk, Sunday's mixed milk and Monday morning's milk, the following table was prepared from the average tests:

Milking.	Average Percentage of	
	Casein	Fat
Morning's Milk (not including Sunday or Monday)	2.30	3.27
Evening's Milk (not including Sunday)	2.31	3.20
Saturday Night's Milk only	2.15	3.24
Monday Morning's Milk only	2.25	3.20
Sunday's mixed, a.m. and p.m. Milks	2.28	3.18

It will be noticed that there is not much variation in the average percentages of casein and fat in the milks delivered at this factory in the mornings, as compared with evening milk and that Saturday night's, Sunday, and Monday morning's milks compare favorably with that delivered during the week, the tendency being for slightly lower percentages of casein in the milks of Saturday night, Sunday, and Monday morning. The common impression among cheesemakers is that Sunday and Monday's milks do not give so good a yield of cheese, as that delivered through the week. So far as the casein and fat tests at this factory are concerned, such milks appear to be about normal in composition.

The Composite Sample for Casein and Fat Determinations.

Most factories in Ontario which "pay by test" use the composite method of sampling for fat determinations, and test, usually, once a month. In order to see whether or not this method of sampling would be satisfactory for casein determinations, each of ten patrons' milk at these factories was preserved with bichromate of potash and tested at the end of four days, or a week, according to the length of time the tester remained at the factory.

The results indicate wide differences in the weight of casein credited by the composite test in five out of fourteen tests, at ten factories. Six out of the fourteen tests were within what may be called the "limits of error." The sign (+) under the difference column in the table, means the number of pounds too great which are credited by the composite test, as compared with the results from daily testing; while the sign (—) means pounds too little credited by the composite method. It will be noticed that in all cases but two, the composite method gave results too high for casein. This is the tendency with composite samples preserved with bichromate, when tested for casein by the Hart Method. Fairly good results can be obtained for composite samples of three or four days, but longer than this has not proved very satisfactory with us. Up to the present we cannot recommend composite sampling at cheese factories for casein determinations by the Hart Method.

The table shows the main points in the results:

COMPARISON OF RESULTS GOT BY DAILY AND COMPOSITE SAMPLING FOR CASEIN AND FAT.

Name of Factory	Lbs. Casein Credited by			Lbs. Fat Credited by		
	Daily Tests.	Comp. Test.	Difference.	Daily Tests.	Comp. Test.	Difference.
Kerwood	171.12	169.50	1.62 –	246.11	251.35	5.24 +
North Oxford { 1	638.29	637.32	.97 –	914.02	907.57	6.45 –
Ingersoll { 2	466.23	480.57	14.34 +	684.30	692.36	8.06 +
Mapleton. { 1	609.25	733.62	124.37 +	867.68	860.81	6.88 –
{ 2	415.69	424.91	9.22 +	610.96	618.21	7.25 +
Springford	334.93	400.14	65.21 +	507.20	496.09	11.11 –
Caledonia { 1	226.98	232.29	5.31 +	313.68	323.48	9.80 +
{ 2	137.89	153.23	15.34 +	202.43	204.76	2.33 +
Dominion { 1	378.11	381.36	3.25 +	574.56	565.89	8.67 –
Atwood { 2	381.14	391.44	10.30 +	567.07	554.71	12.36 –
Central Smith	291.40	339.14	47.74 +	476.42	473.02	3.40 –
Mountain View	378.47	386.02	7.55 +	617.10	625.49	8.39 +
Aberdeen	355.57	376.97	21.40 +	581.27	583.94	2.67 +
Navan	333.74	360.83	27.09 +			

In addition to the work reported, Mr. Cherry made a number of tests for fat and casein, of milk in the factory vats; also of special samples of milk brought to be tested, and samples of whey and buttermilk at one factory. The vats of milk ranged from 2 to 2.3 per cent. casein and 3.4 to 3.7 per cent. fat. The whey samples tested .05 to .1 per cent. casein, and .2 to .27 per cent. fat. (We are indebted to Mr. Cherry for his faithful and painstaking services).

CONCLUSIONS.

1. The single tests of casein in patrons' milk at these ten factories varied from 1.84 to 2.67 per cent. The average percentage of casein in the milk as delivered to six Western Ontario factories during the time these tests were made, was 2.26; at four factories in Eastern Ontario the average was 2.11; the average of all was 2.22. The percentage of fat in the milk at Western Ontario factories averaged 3.42, and for Eastern Ontario 3.44.

2. At one factory in Western Ontario, Saturday night's, Sunday and Monday morning's milk compared favourably with the milk as delivered at this factory during the week, in casein and fat content.

3. The composite sampling for casein was not satisfactory—the tendency being for tests too high, using the Hart Casein Tester.

4. Milk ought to be tested at cheese factories, and be paid for on the fat-casein basis. In the meantime "fat + 2" is near enough for all practical purposes, and represents fairly close the *available* casein and fat in milk for cheese-making.

FAT AND CASEIN IN TEN PATRONS' MILK DELIVERED AT THE DAIRY DEPARTMENT, SEASON, 1911.

These investigations have been carried on now during the past four seasons—1908, '09, '10, and '11, with largely the same patrons' milk each season. In 1909 there were eleven patrons delivering milk; in 1910 twelve patrons; and in 1911

ten patrons, two of whom sent but part of the season. The work was carried on similarly to that of last year. The average percentages of fat and casein by months for each of the ten patrons, were as follows:

Patron.	April.		May.		June.		July.		August.		Sept.		October.		Season.	
	Fat.	Casein.	Fat.	Casein.	Fat.	Casein.	Fat.	Casein.	Fat.	Casein.	Fat.	Casein.	Fat.	Casein.	Fat.	Casein.
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
No. 1	3.53	2.53	3.50	2.10	....	....	....	....	....	....	....	....	....	....	3.51	2.31
No. 2	4.00	2.30	3.65	2.20	3.78	2.14	3.75	2.00	3.97	2.32	3.90	2.7	3.60	2.80	3.80	2.35
No. 3	3.73	2.40	3.75	2.37	3.50	2.28	3.55	2.20	3.70	2.42	3.70	2.45	4.10	2.93	3.72	2.43
No. 4	3.56	2.23	3.47	2.27	3.60	2.30	3.60	2.00	3.77	2.15	3.95	2.50	4.06	2.86	3.71	2.33
No. 5	4.13	2.60	3.87	2.37	3.84	2.36	4.35	2.25	4.22	2.30	3.60	2.45	3.90	2.93	3.98	2.46
No. 6	3.60	2.56	4.17	2.40	4.12	2.26	3.75	2.20	4.15	2.32	3.90	2.60	4.86	2.83	4.08	2.45
No. 7	3.76	2.10	3.50	2.15	4.06	2.34	3.60	1.90	3.90	2.17	3.75	2.20	3.93	2.70	3.78	2.22
No. 8	3.56	2.26	3.90	2.32	3.80	2.36	3.40	2.15	3.65	2.30	4.10	2.55	4.75	3.20	3.88	2.44
No. 9	3.10	1.96	3.02	2.07	3.62	2.25	3.05	2.00	3.45	2.25	3.30	2.45	3.60	2.70	3.30	2.24
No. 10	3.60	2.30	3.80	2.60	....	....	....	....	....	....	....	....	....	....	3.70	2.45
Average of all	3.65	2.32	3.66	2.28	3.79	2.28	3.63	2.08	3.85	2.28	3.77	2.49	4.1	2.86	3.77	2.37

Comments on Results.

1. Samples of each patrons' milk was tested for both fat and casein from two to five times each month during the season from April to October inclusive. The lowest single test for fat was 2.8 per cent., which occurred in the milk of patron No. 9, once in May and once in August. Patron No. 4 had a test as low as 2.9 in May. The highest percentage of fat in any single test was that of Patron No. 5, in October—5.2. This patron's milk frequently tested over 4 per cent. fat. The lowest single test of casein in a patron's milk was 1.8, which occurred in the milk of Patrons No. 7 and 9, in the months of April, May, and July. Several samples tested 1.9 and 2 per cent. of casein. The highest single test of casein was 3.2 per cent. in the milks of Patrons Nos. 5 and 8, during October.

2. The milk delivered in the months from April to September, inclusive, averaged about the same percentages of fat for each month. The percentage of casein averaged lowest during July, for three seasons—1909, 1910, and 1911. The milk during the months of September and October averaged highest in casein. The milk for these months is usually high in both fat and casein content, consequently the yield of cheese is usually greater than earlier in the season. This increase in percentage of fat and casein is probably due to advancing lactation among the cows supplying milk for cheese-making, which cows usually freshen in the Spring of the year, when the factories open.

3. The average of the monthly tests of these ten patrons' milks for the season 1911 was 3.77 per cent. fat, and 2.37 per cent. casein. The averages last season were 3.83 and 2.46 for fat and casein, respectively, which is somewhat higher than for the season 1911.

Vat Tests of Casein and Fat, Season 1911.

This is the fourth year during which a number of tests each month were made of the casein and fat in the vats of milk delivered to us by the patrons supplying milk for cheese-making at the dairy department of the College.

The averages of the past four years have been as follows:

Year.	Average per cent.	
	Casein.	Fat.
1908	2.39	3.67
1909	2.50	3.60
1910	2.46	3.60
1911	2.30	3.58

The average percentages of casein and fat for the four years is fairly uniform, but is lowest for the year 1911 in both casein and fat. This is probably accounted for by the very dry season of this year.

The following table shows the range and average of vat tests of milk for casein and fat during the season of 1911.

Month.	No. vat tests made.	Per cent. casein in milk.		Per cent. fat in milk.		Average lbs. cheese per lb.		Lbs. milk to make 1 lb. cheese.
		Range.	Average.	Range.	Average.	Casein.	Fat.	
April	12	2.2 to 2.8	2.37	3.3 to 4.0	3.66	3.69	2.61	10.62
May	18	2.0 to 2.5	2.25	3.3 to 3.7	3.50	3.91	2.54	11.23
June	23	2.0 to 2.5	2.29	3.2 to 3.7	3.48	3.82	2.56	10.91
July	10	2.0 to 2.2	2.17	3.1 to 3.4	3.28	3.99	2.58	11.42
Aug.	18	1.8 to 2.6	2.15	3.0 to 4.2	3.45	3.87	2.43	11.25
Sept.	12	2.1 to 2.6	2.38	3.4 to 4.0	3.73	4.05	2.58	10.22
Oct.	7	2.4 to 2.9	2.53	3.7 to 4.4	3.93	3.99	2.45	10.04

The total number of lbs. of milk made into cheese during the season of 1911 (April to October) was 145,264. The total lbs. of cheese made were 13,445.7. The average lbs. of milk required to make a pound of cheese were 10.8.

Exactly 100 vat tests were made during the season. The lowest percentage of casein in any single vat of milk was 1.8; the highest, 2.9. The lowest percentage of fat in any one vat of milk was 3.0; the highest 4.4. The lowest average percentage of casein by months was 2.15 for August; the highest 2.53 for the month of October. The lowest average percentage of fat by months was in July, 3.28; and the highest

in October, 3.93. During the months of September and October, the milk is usually highest in both casein and fat, consequently the yield of cheese per 100 lbs. milk is greater in those months than is the case earlier in the season. This increased percentage of cheese-making material in milk during these months is probably due to advanced lactation in the cows, which usually freshen early in the season, for the cheese factory season. The months of July and August are usually unfavourable months for a good yield of cheese, because the percentages of fat and casein in the milk are then low, as a rule.

The Comparative Influence of Milks Containing High and Low Percentages of Casein and Fat, on the Yield and Quality of Cheese Made.

This is the fourth year during which tests have been conducted on the relative influence of milks containing high and low casein and fat, on the weight of cheese made and on the quality of the cheese.

As explained in previous years, tests were made from time to time during the season for the fat and casein in each patron's milk sent to us for cheese-making. The milk from these patrons supplying milk with comparatively high percentages of casein and fat, was placed in one vat, and that from those with low percentages of casein and fat was placed in another vat. Twenty experiments were made, in which 11,637 lbs. milk, testing an average of 3.47 per cent. fat and 2.23 per cent. casein, were used in one set; and the same weight of milk, testing an average of 3.71 per cent. fat and 2.43 per cent. casein in the other set.

The average percentages of fat in the whey from the low and high casein milks were .178 and .194 respectively, while the casein in the whey averaged .08 and .07 per cents.

The main points in the experiments are shown in the table:

	Low casein and fat lots.	High casein and fat lots.
Total lbs. green cheese	1088.10	1155.46
" Cheese 1 month old	1058.01	1122.46
Per cent. shrinkage in 1 month	2.71	2.88
Lbs. cheese per 1,000 lbs. milk	90.91	97.31
Lbs. milk per lb. cheese	10.98	10.36
Lbs. cheese per lb. fat in milk	2.62	2.60
Lbs. cheese per lb. casein in milk	4.07	3.96
Per cent. fat in cheese	35.72	36.11
" moisture in green cheese	35.47	35.29
" " in cheese 1 month old	35.29	35.30
Average score for flavor (40)	35.97	36.63
" " closeness (15)	14.17	14.36
" " color (15)	14.11	14.19
" " texture (20)	17.00	17.33
Average total score (100)	91.25	92.51

(All cheese scored ten points for finish.)

Conclusions.

1. The milks with the higher percentages of casein and fat, produced an average of 6.4 lbs. more cheese per 1,000 lbs. milk, as compared with the lots having lower casein and fat. (Last year it was 4.64.)

2. The yields of cheese per lb. fat and casein was 1.59 lbs. from the lots with low casein and fat, and 1.571 from the higher casein and fat content milks. This difference is not sufficient to cause any great error by using the fat casein method as a basis of dividing money among patrons of cheeseries.

3. The cheese made from the higher fat-casein content milks contained a higher percentage of fat by .39.

4. There was little difference in the moisture content of the cheese from the two lots.

Moisture in Curd and Cheese From Eastern Ontario Cheeseries, 1911.

During the years 1909 and 1910 we received samples of curd and cheese from the cheese factories of Western Ontario, the results of which, in moisture content, we have outlined in two previous reports.

In 1911 we arranged with Mr. Publow, Chief Instructor for the Eastern section of the Province, to have the instructors in representative districts send us samples to test for moisture content. Ten of the instructors were kind enough to comply with our request and we desire to express our thanks to them for their courtesy.

Instructions for taking samples, and sample bottles were mailed to each, and these were returned to the Dairy Department of the College as soon as possible after sampling at the factory. The samples consisted of curd after stirring, or when the whey had been removed, green cheese from the same curd, and cheese from the same, when one month old. In a few cases samples were lost in the mail, a few had leaked during transit, and some samples of cheese one month old were not sent. The following factories contributed samples: Balderson, Bobcaygeon, Central Smith, Cheeseboro, Circle No. 7, Farmersville, Fraserville, Foxboro, Glen Elbe, Hallville No. 1, Kaladar, Kidd's No. 2, Leed's Union, Mountain, McLean No. 1, Oak Leaf, Point Traverse, Quinte, Reaboro, Rockdale, Royal St., Shannonville, Sidney Town Hall, Tallace, Thurlow, Williamsburg.

The samples were sent during the months of May, June, July and August. Each of four instructors sent all his samples from one factory in his district.

The average percentages of moisture in curd, green cheese, and cheese one month old, in all the lots sent in by each instructor, were as follows:

Name of Instructor.	Average per cent. Moisture in			
	No. of Samples.	Curd.	Green Cheese.	Cheese 1 month old.
Mr. D. J. Cameron, Peterboro	4	43.52	34.45	34.56
Mr. S. S. Cheetham, Gananoque	2	44.50	38.90	35.65
Mr. J. H. Echlin, Balderson	3	45.20	35.30	35.26
Mr. W. G. Gardiner, Kemptville	3	44.06	34.60	32,70
Mr. H. Howey, Belleville	9	44,00	34.24	34.64
Mr, C. B. Larry, Finch	2	43.80	34.40	33.50
Mr. C. W. Norval, Williamsburg	7	44.91	35.40	35.23
Mr, R. W. Ward, Peterboro	3	45.46	34.66	35.65
Mr. T. E. Whattam, Picton	3	45.73	35.11	34.60
Mr. A. H. Wilson, Athens	6	44.37	35.32	34.68
Total and Average of all	42	44.555	35.238	34.647

The extreme variations in the moisture content of curd samples from all the factories was 42 to 49.8 per cent.; in the green cheese, 32 to 40; and in the cheese one month old, 32.4 to 36.4. By groups or districts the extreme average variations in curd, green cheese, and ripe cheese, were respectively, 43.52 to 45.73, 34.4 to 38.9, 32.7 to 35.65.

Comparing these results with those got from samples sent in from Western Ontario factories in 1910, we find the curds from Eastern Ontario average 2.249 per cent. more moisture at the time of dipping than did those from Western Ontario; the green cheese, .574 higher, and the cheese one month old practically the same—34.647 per cent. as compared with 34.638 per cent. in Western Ontario samples, 1910.

As in former years, we found quite a number of samples of cheese one month old containing about the same, or a higher percentage of moisture than did the green cheese. We shall discusss this point more in detail under our own work in this connection. Some of the Eastern instructors wrote for an explanation as to how it was possible for the cheese one month old to contain about the same, or in some cases, more moisture than did the green cheese. Our reply in brief was, that the edible portion of a cheese does not lose moisture, as is commonly supposed; and in some cases it is possible that the edible portion of a cheese in ripening, may absorb moisture from the rind, or from the surrounding atmosphere.

Loss of Moisture in Cheese During One Month of Ripening.

When and where do the losses of cheese, during ripening, take place? This question we endeavored to answer in several ways. First, by making two cheese, weighing from 60 to 80 lbs. each, on April 27th, June 5th, July 27th, and Sept. 8th. One of the cheese on each date was placed in our ordinary ripening room where the temperature ranged from 60 to 75°F. The other was placed in an ice cold-storage at an average temperature of about 40°F. The cheese were tested for moisture before placing in the rooms, and weekly thereafter for 4 to 6 weeks. Plugs were taken from each cheese and divided into inch lengths. These were tested at the first, second and third inch of each plug, for moisture. Up to August 19th, the top of each plug was put back in the cheese to close the opening, therefore the results to that date represent the moisture in the first, second and third inch of the edible portion of each cheese. After August 19th, the top or rind of each plug was included in the samples from the first inch of each cheese in all the tests.

Weight of Moisture in Rind of Cheese.

On Sept. 18th, 1911, a cheese was made weighing 42.25 lbs. when green. The cheese contained 34.1 per cent. moisture when green and 33.8 per cent. moisture at the end of one month in the edible portion, or that part of the cheese not including the rind. The rind contained 20.8 per cent. moisture. At the end of one month the cheese weighed 41.06 lbs. The rind was carefully cut from the cheese and weighed, the weight being 4.81 lbs., including bandage and cap circles. The object of this experiment was to ascertain what proportion of the cheese is not edible, and how much moisture was included in the rind, bandage, and caps, and also whether or not we could account for the loss in weight.

The table gives the results of these tests.

Dates of sampling for moisture.	Cheese ripened in ordinary room at 60 to 75°F.						Cheese ripened in ice storage at 40°.					
	W'ght. green cheese	Per cent. moisture in—					Wght. green cheese	Per cent. moisture in—				
		Green cheese	1st inch.	2nd inch.	3rd inch.	Average.		Green cheese	1st inch.	2nd inch.	3rd inch.	Average.
	Lbs.						Lbs.					
April 27	72	34.9	.....	.....	.....	.....	72	35	.....	.....	.....	.....
May 5	.....	.....	33.9	34.4	34.1	34.1	.....	.....	35.2	35.	34.8	35.
" 12	.....	.....	34.8	34.7	34.7	34.7	.....	.....	34.7	34.7	34.6	34.7
" 19	.....	.....	34.2	35.0	34.4	34.4	.....	.....	35.4	35.	35.	35.1
" 26	.....	.....	33.9	33.9	34.6	34.1	.....	.....	34.8	35.	35.	34.9
June 2	.....	.....	34.8	34.6	34.2	34.4	.....	.....	34.6	35.2	34.6	34.8
Av. of all	.....	.....	34.3	34.5	34.4	34.3	.....	.....	34.9	35.0	34.8	34.9
June 5	78	35.6	.....	.....	.....	.....	80	35.6	.....	.....	.....	.....
" 13	.....	.....	36.2	36.	36.	36.1	.....	.....	36.1	36.	35.6	35.9
" 20	.....	.....	35.8	35.6	35.6	35.7	.....	.....	35.8	35.7	35.6	35.7
" 27	.....	.....	34.8	35.4	35.2	35.1	.....	.....	35.8	35.6	35.6	35.7
July 4	.....	.....	35.4	35.6	35.6	35.5	.....	.....	35.6	36.	35.6	35.7
Av. of all	.....	.....	35.5	35.5	35.6	35.6	.....	.....	35.8	35.6	35.6	35.8
July 27	60	35.5	.....	.....	.....	.....	60	35.5	.....	.....	.....	.....
Aug. 5	.....	.....	35.4	36.1	35.8	35.8	.....	.....	35.4	35.4	35.2	35.3
" 12	.....	.....	35.2	35.4	35.2	35.3	.....	.....	34.8	35.2	35.5	35.2
" 19	.....	.....	34.6	35.9	35.4	35.3	.....	.....	35.8	35.6	35.5	35.6
Av. of 3 tests	.....	.....	35.1	35.8	35.5	35.5	.....	.....	35.3	35.4	35.4	35.4
Aug. 26 (Rind included in 1st inch)	.....	.....	29.5	35.4	35.6	33.5	(Rind in 1st	includ inch.)	32.8	35.2	35.4	34.5
Sept. 2	.....	.....	31.4	35.2	35.4	34	.....	.....	32.5	35.3	35.2	34.3
Av. 2 tests (rind in 1st inch samples.	.....	.....	30.5	35.3	35.5	33.8	.....	.....	32.7	35.3	35.3	34.4
Sept. 8	72	35.6	.....	.....	.....	.....	76	35.6	.....	.....	.....	.....
" 16	.....	.....	32.2	35.6	35.2	34.3	.....	.....	33.4	34.9	35.4	34.6
" 22	.....	.....	31.	34.8	34.6	33.5	.....	.....	32.	34.6	35.4	34.
" 29	.....	.....	31.8	34.4	34.8	33.7	.....	.....	32.8	35.3	35.3	34.5
Oct. 6	.....	.....	30.6	34.8	34.4	33.3	.....	.....	33.	34.8	34.8	34.2
Av. of all	.....	.....	31.4	34.9	34.8	33.7	.....	.....	32.8	34.9	35.2	34.2
Av. of averages, (rind not included)	.....	.....	34.96	35.26	35.16	....	.....	.....	35.4	35.33	35.26	....
Av. of averages, (rind included in 1st inch	.....	.....	30.95	35.10	35.15	....	.....	.....	32.75	35.10	35.25	....

It will be noted that nearly one-ninth of the original weight of the cheese was included in the rind, etc., which is not edible. The cheese lost in weight 1.19 lbs. The moisture was accounted for as follows:

14.40725 lbs. in Green Cheese.
12.23222 lbs. in edible portion of Ripe Cheese.
1.00048 lbs. in Rind, etc., " "
1.17455 lbs. unaccounted for, but probably evaporated.

In this case the loss in weight during ripening and the moisture not accounted for are practically the same.

On October 9th two cheese were made, weighing 72.19 and 74.25 lbs. each. The first was sampled weekly for moisture up to Nov. 7th. Samples were taken

of the first inch, including rind, second inch, and third inch of each plug taken from the cheese. The other cheese was used as a check or control cheese, to note loss of weight during one month. The percentage of moisture in the green cheese was 34.6, and weekly thereafter as follows:

Date.	1st Inch Including rind.	2nd Inch.	3rd Inch.
October 17.....	33.8	34.8	34.6
" 24.....	33.3	35.0	34.6
" 31.....	30.4	34.9	34.6
November 7.....	30.4	34.8	34.6
Average	31.98	34.88	34.6

It will be noticed that in this case the loss of moisture was altogether in the first inch, including the rind of the cheese. Assuming that both cheese lost in weight at the same rate, and that the weight of rind in the cheese not bored was in the same relative proportion as in the smaller cheese from which the rind was cut on Sept. 18th, we have:

25.69050 lbs. moisture in Green Cheese.
22.18206 " " " edible portion at end of one month.
2.56880 " " "Rind, etc.
24.75086 " " accounted for.
.93964 " " probably evaporated.
.75036 " loss in weight not accounted for.

The first one-quarter of an inch from a plug taken from the side of a cheese ripened in an ordinary room, tested 26.5 per cent. moisture, the second quarter of an inch of the same plug contained 34 per cent. moisture.

A plug taken from the top of a cheese in the ordinary room showed 32.8 per cent. moisture when the rind was included in the sample. A plug taken from the same cheese and sampled without the rind, contained 35.2 per cent. moisture.

A similar experiment on a cheese ripened in an ice cold-storage gave results as follows: 34.2 per cent. moisture in the sample which included the rind and 35.2 per cent. when the rind was not included.

These results show quite a marked difference in the moisture content of rind and edible portion of the cheese, and it makes considerable difference in the moisture tests of samples of cheese, whether or not the rind be included, more particularly is this so where cheese are ripened at comparatively high temperatures. The difference is not so great when sampling from cheese ripened at a comparatively low temperature (40°F). On the whole, we are inclined to favor sampling for the moisture content of cheese from the edible portion only and not to include the rind. Except where not especially mentioned, this is the method followed in all our experimental work.

Conclusions.

1. Cheese lose more moisture when ripened in an ordinary room at a temperature ranging from 60 to 75°F., than in a room fairly uniform in temperature at 40°F. This difference is usually one or two per cent. in favor of ripening at the lower temperature.

2. Most of the loss in moisture in ripening occurs from the rind or first quarter of an inch on the surface of the cheese, and during the first week of ripening. The

edible portion of the cheese under ordinary conditions does not lose moisture during the ripening process. The losses after the first week are much less than during the first seven days. In some cases there is an apparent *gain* in moisture, but this may be due to errors in sampling, or to unequal distribution of moisture in the cheese, although the results of tests, indicate fairly uniform distribution of the water in cheese throughout the edible portion. The evidence points very strongly to an increase in moisture content in the edible portion of some cheese.

3. In a number of cases it is difficult to account for all the loss in weight of cheese during ripening, unless we assume that ripening results in chemical changes which produce gases that pass out from the cheese, causing loss in weight.

4. There is room for a difference of opinion as to whether a sample for moisture content of a cheese should include the rind, or be taken from the edible portion only. As previously stated, we are inclined to favor leaving out the rind, except in special cases, as it is the *edible* portion of a cheese which is valuable. The rind, bandage, and caps have no food value, and are merely agents for carrying the food contained within them.

Loss in Making Overripe Milk into Cheddar Cheese.

This is the fourth year for these tests to ascertain how much loss is sustained by allowing milk to become overripe or develop too much acid for cheddar cheese-making. As pointed out last year, there are objections to the method followed in conducting these experiments, but as they correspond with factory conditions they are near enough correct for practical purposes, but are not scientifically correct.

The method followed was to take the milk arriving overripe at various times during the season and make this into cheese in the best manner possible, then compare these results with those obtained on previous or succeeding days when the milk was normal.

There were made during the season of 1911, twelve experiments, seven of which were overripe lots, and five were normal. The seven lots consisted of 21,038 lbs. milk having an average of 3.41 per cent. fat and 2.22 per cent. casein. The five normal lots contained 6,743 lbs. milk, testing an average of 3.43 per cent. fat and 2.19 per cent. casein—practically the same as the overripe lots. The percentages of fat and casein in the whey from the overripe lots were respectively, .171 and .085, while the wheys from the normal lots averaged .167 per cent. fat and .069 per cent. casein. The overripe lots remained in the whey for an average of 49 minutes, while the normal lots were in an average of 2 hours and 40 minutes.

The remainder of the results are shown in the table following:

	Normal Lots.	Overripe Lots.
Lbs. cheese per 1,000 lbs. milk	89.94	87.54
Lbs. milk per lb. cheese	11.11	11.44
Per cent. shrinkage at 1 month old	2.76	2.15
" moisture in green cheese	34.94	34.50
" " cheese 1 month old	35.10	34.43
Average score for flavor (40)	35.76	35.07
" " closeness (15)	14.25	14.28
" " color (15)	14.43	14.28
" " texture (20)	17.52	16.95
" " total (100)	92.06	90.58

All cheese were scored 10 points for "finish."

Conclusions.

1. Last year the normal lots produced an average of 2.58 lbs. more cheese per 1,000 lbs. milk, as compared with the overripe lots; this year the difference was 2.4 lbs. in favor of the normal lots.

2. Both last year and this year the normal lots of cheese contained higher percentages of moisture.

3. In both years the quality of the cheese was superior from the normal lots

The practical lesson is that patrons of cheeseries should prevent so far as possible, milk becoming overripe, as such milk causes a loss of cheese-making material and produces a poorer quality of cheese. The milk can be prevented from becoming overripe by cleanliness, and cooling it to about 65° F on the farm.

Effect of Acid at the Time of Renneting Milk for Cheese-making.

These experiments are a continuation of the work done last year. Seven experiments were made in which were used 8,162 lbs. milk, testing an average of 3.47 per cent. fat and 2.34 per cent. casein. The milk for each experiment was thoroughly mixed and divided between two vats, in one of which the average percentage of acidity at the time of dipping, or removal of the whey, was, .198, while in the other the acidity averaged .171 per cent. The percentages of acidity at the time of dipping, milling and salting were practically the same for each lot. The percentages of fat in the whey were .16 for each lot.

The main points in the test are shown in the table:

	A. Acidity at Setting .198 per cent.	B. Acidity at setting 171 per cent.
Hours from setting to dipping	1H. 21M.	2H. 35M.
" " dipping to salting	3H. 36M.	3H. 32M.
Lbs. green cheese	385.75	387.25
" cheese 1 month old	374.56	375.95
Per cent. shrinkage	2.90	2.91
Lbs. cheese per 1000 lbs, milk	91.781	92.124
" milk per lb. cheese	10.89	10.85
Per cent. moisture in green cheese	35.20	35.30
" " " ripe "	35.28	35.32
Average total score of cheese (100)	91.62	92.04

Conclusions.

The results are similar to those of last year, viz., less yield of cheese (.34 lb. per 1,000 lbs. milk), by having a comparatively high percentage of acid in the milk at the time of adding the rennet, and also a slightly poorer quality of cheese.

Effects of Acid at the Time of "Dipping" Curd.

These experiments are a continuation of the work done last year, in which we found a greater yield of cheese by "dipping" the curds sweeter; also less loss of fat in the whey, but the quality of cheese did not seem to be affected very much by the range of acid as used in the tests.

During the season from April 18th to Aug. 23rd, 1911, eleven experiments were made relating to this question, for which were used 13,884 lbs. milk testing

an average of 3.59 per cent. fat and 2.24 per cent. casein. Each lot of milk was divided into two equal and similar parts. One lot designated A, was dipped with an average of .203 per cent. of acid, reckoned as lactic acid, while the other lot B, was dipped with an average of .17 per cent. acid. All other parts of the work in the two lots were as nearly alike as possible. The milk was renneted with an average of .177 per cent. acid; curds were milled with .697 per cent. acid and salted with .976 per cent. acid for the A lots, and .962 per cent. as the average for the B. lots. The average percentage of fat in the whey from the A lots was .15; from the B lots .18. So far as we could tell by making tests of the whey there did not appear to be much difference in the losses of casein in the whey, although the Hart Casein test is not very satisfactory for ascertaining losses of casein in whey.

The total weight of cheese, one month old, from the A lots dipped with the higher acid, was 629.82 lbs., while the B. lots weighed 632.76 lbs., a difference on 6,942 lbs. milk, of 2.9 lbs. more cheese in favor of dipping comparatively sweet. The percentage of shrinkage in one month was 2.5 for the A lots and 2.2 for the B lots.

The following table brings out some of the main points in the experiments.

——	Lbs. cheese per 1,000 lbs. milk.	Lbs. milk to make 1 lb. cheese,	Percentage of moisture in		
			Curd.	Green cheese.	Cheese 1 mo. old.
A. (High acid at dipping)....	90.72	11.02	48.16	35.01	34.83
B. (Low acid at dipping)....	91.14	10.99	49.66	35.18	35.16

Averaging the scores of the cheese there was not that difference in quality, which might have been expected.

——	Flavor. (40)	Closeness. (15)	Even Color. (15)	Texture. (20)	Total. (100)
A	36.05	14.15	14.050	16.775	91.025
B	36.10	14.15	14.176	17.087	91.513

Conclusion.

(1) The difference in yield of cheese per 1,000 lbs. milk was not so great as last year, which was .733 lbs., while this year it was but .42 lbs. Both years' results emphasize the need of dipping with less than .2 per cent. acid, in order to have "a good average," or to reduce the number of pounds of milk required to make one pound of cheese.

(2) The percentages of fat and casein lost in the whey were slightly greater from the higher acid lots, but the difference was not very great. However, the tests commonly used for determining the losses of fat and casein in whey are not altogether satisfactory, and it is well not to lay too much stress on this point.

(3) As was the case last year, the cheese made from the curds dipped comparatively "sweet" were slightly better in quality, but the difference was not very marked. Both years the difference was represented by a total score of less than half a point, in 100.

(4) Both years results indicate a slightly higher moisture content in the curd and cheese from the lots dipped with less acid, indicating that the development of acid tends to expel moisture, which corresponds with practical experience on this point, as it is generally conceded that high acid at dipping tends to produce "bony" cheese.

Stirring vs. not Stirring Curds at the time of Dipping.

This is a continuation of the work done during the past three seasons, except that the curd was divided into three nearly equal parts at the time of dipping, instead of into two parts as formerly. The A. curds were not stirred, but simply allowed to drain in the curd-sink; the B. curds were stirred slightly; and the C. curds were stirred "dry." Altogether ten experiments were made during the season, for which there were used 16,456 lbs. milk, testing an average of 3.47 per cent. fat, and 2.2 per cent. casein. The percentage of acid at the time of dipping, averaged .176 for all three lots; the percentages of acidity at milling were .643, .636, and .63; at salting—1.02, .917, and .901, respectively, for the A, B, and C lots. The percentages of shrinkage during one month were 3.09, 2.48, and 2.23, respectively, for A, B, and C, lots. The average percentages of moisture in curd and cheese, also the average scores of the cheese are shown in the table.

	Per Cent. Moisture in:			Average score for:				
	Curd at dipping.	Green Cheese.	Cheese 1 month old.	Flavor.	Closeness.	Color.	Texture.	Total.
	Per cent.	Per cent.	Per cent.	(40)	(15)	(15)	(20)	(100)
A....	52.73	35.20	34.93	35.55	14.11	14.15	16.75	90.56
B....	46.51	34.86	34.81	35.86	14.30	14.32	17.05	91.53
C....	45.00	34.43	34.43	36.10	14.62	14.39	17.20	92.31

Conclusion.

Last year we said; "The results of three years work on this question indicate that there is probably little or no advantage in giving curds so much stirring at the time of dipping, as is the common practice among cheesemakers; on the other hand, it is probably an advantage to the quality of the cheese to do some stirring at the time the curd is placed in the curd sink, or upon a rack in the vat." The results of this year's tests confirm our conclusion of last year, as the cheese made by stirring slightly, averaged one point higher in the scorings than did those made from curds not stirred at all, but they are about three quarters of a point lower in average scorings than these made from curds stirred "dry." The difference in quality in each of the three lots is not very great. Stirring tends to decrease the yield of cheese per 1,000 lbs. milk, but also tends to improve the quality slightly. We are inclined to think that many cheesemakers stir their curds more than is necessary. However, the market demands for "Improved quality" in cheese are so insistent that most makers feel that it is safer to sacrifice some in "quantity," in order not to run risks on "quality."

Effects of Two Methods in Salting Curds.

(*a*) Salt Based on Weight of milk vs. Weight of Curd.
(*b*) An increase of One Quarter Pound of Salt per 100 lbs. Curd.

It is customary among cheesemakers to base the weight of salt applied to a curd, on the weight of milk in the vat from which the curd was taken. The rate of salting is usually from two to three pounds of salt per 1,000 lbs. of milk, according to the season, moisture in the curd, length of time the cheese are likely to be kept in the factory before shipping, and upon the estimated yield of cheese from the milk. In our experimental and investigational work we apply the salt at a rate per 100 lbs. curd. There is a tendency on the part of cheesemakers to salt curds more lightly than was formerly the case, in order to overcome the tendency to harshness in cheese where heavy salting is practised.

Two lines of work were undertaken during the past season in order to throw more light on these questions.

(a) Eleven experiments were made, comparing the effects of salting on the basis of weight of milk, with salting based on weight of curd. Altogether there were used 11,112 lbs. milk, testing an average 3.66 per cent. fat and 2.33 per cent. casein. The milk for each test was evenly divided between two vats and both were treated as nearly alike as possible, up to the time of salting, when the curds in the A lot were salted at the rate of 2 to 2¼ lbs. salt per 100 lbs. curd, while those from the B vats were salted at the same rates per 1,000 lbs. milk.

The A vats produced 528.27 lbs. green cheese and 512.33 lbs. of cheese at the end of one month, having lost in weight 3.02 per cent. in that time. The B vats produced 530.89 lbs. green cheese and 514.87 lbs. cheese at the end of one month. The percentage of shrinkage was practically the same as for the A lots. The average percentage of moisture in the curds at dipping, in the green and ripe cheese, were practically the same for both lots. The average total scores of the cheese from both lots were practically the same—91.59 for the A's and 91.65 for the B lots.

So far as these tests are concerned, there would seem to be little difference in the results whether salting be based on weight of curd, or on weight of milk.

(*b*) In these tests consisting of seventeen experiments for which were used 17,906 lbs. milk, testing an average of 3.5 per cent. fat and 2.25 per cent casein, the object was to note the difference, if any, where an extra one-quarter pound of salt per 100 lbs. of curd was added, other treatment of milk, curd and cheese, being similar, so far as possible. The rate of salting was 2 and 2¼ lbs. per 100 lbs. curd, early in the season; 2¼ and 2½ lbs. later, respectively, for the A and B lots of cheese. The A lots having ¼ lb. less salt applied to the 100 lbs. curd, lost in weight during one month 2.98 per cent, while those made by heavier salting, shrank 3.02 per cent in one month. The percentages of moisture in the green and ripe cheese were practicaly the same for both lots. The cheese made by the heavier salting methods scored an average of nearly one-half point higher in flavor, but the scores in other points were practically the same. The average total score for the A lots, salted one-quarter pound less than the B lots, was 91.69 points out of 100. The B lots scored an average of 92.28 points—a little over one-half a point higher than for the A lots.

So far as these results are indications of good practice, they point to the advisability of using 2¼ lbs. to 2½ lbs. of salt per 100 lbs. curd, rather than 2 to 2¼ lbs., the chief advantage being a better flavor in the cheese as a result of the heavier salting.

These tests need to be repeated with possibly wider differences in the rate of salting, in order to obtain better comparative results.

Ripening Cheese in Cold Room vs. Ordinary Room.

Some years ago we conducted an extensive series of investigations with reference to the best temperature at which to ripen (cure) cheese, and also as to whether or not it was advisable to place cheese at once in a room where the air was cold, or whether they should remain at a moderately warm temperature for a week before placing in a cold room. These investigations led us to conclude that the best results in saving of shrinkage, and in obtaining good quality of cheese, were got by placing cheese directly from the hoops into a room where the temperature was approximately 40 degrees F., althought there was little difference in results got by placing the cheese in an ordinary ripening (curing) room for a week, then ripening at the lower temperature.

Requests having been made for further light on the question, another series of experiments were made during the season of 1911. There were used for the tests 9,561 lbs. milk containing an average of 3.53 per cent. fat and 2.24 per cent. casein. The average percentage of fat in the whey was .15. There were five experiments made,—Three cheese in each lot marked, A, B and C. The A lots were put directly from the hoops into an ice cold-storage at a temperature of about 40 degrees F. The B lots were put into an ordinary ripening room for one week where the temperature ranged from 60 to 75 degrees F., then were moved to the cold storage. The C lots were ripened in the ordinary room. Cheese were weighed when taken from the hoops and again at the end of one month. The moisture was determined in the green and ripe cheese. The cheese were scord twice by Mr. Frank Herns—first time, when about 6 weeks old, and again a month later.

The main point brought out in the experiments are shown in the table:

	A Ripened at 40°.	B Ripened at 40° at end of 1 week.	C Ripened at 60° to 75°.
Pounds green cheese	208	203.88	201.69
Pounds cured cheese	202.13	197.88	193.75
Pounds shrinkage	5.87	6.00	7.94
Per cent. shrinkage	2.82	2.94	3.93
Per cent. moisture in green cheese	34.85	34.85	34.85
Per cent. moisture in cheese 1 mo. old	34.65	34.67	34.12
Average score for flavor (40)	36.93	36.75	35.87
Average score for closeness (15)	14.25	14.37	13.93
Average score for color (15)	14.50	14.42	14.25
Average score for texture (20)	17.75	17.42	16.37
Average score for total (100)	93.43	92.96	90.42

Note.—All cheese were scored 10 points for "finish."

Conclusions.

These results agree with those obtained in previous experiments and indicate a saving of about one per cent. shrinkage by placing cheese at once, or within a week, in a room at 40 degrees to ripen, as compared with ripening at 60 to 75 degrees F. The quality of the cheese was better by ripening at the lower temperature, there being not very much difference between placing at once in the cool room, as com-

pared with placing in the cold room at the end of one week, what difference there was being in favor of placing cheese directly from the hoops in a room where the temperature was about 40 degrees F.

I am under obligations to my assistants, Messrs. McKay, Rickwood and Golding; to the Instructors of the Dairy School; to the Chemical and Bacteriological Departments, more particularly for assistance with the Short Course Students; to Messrs. Frank Herns, and Fred Dean, for assistance in Scoring Cheese and Butter in our experimental work; to Mr. P. A. B. Cherry; to the ten Instructors in Eastern Ontario and to those factorymen of the Province who co-operated in our investigations during the season. To all of these I desire to express my appreciation and thanks.

Yours respectfully,

H. H. DEAN.

PART IX.

THE PROFESSOR OF ANIMAL HUSBANDRY AND FARM SUPERINTENDENT.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit herewith the report of my Department for the year 1911.

THE DAIRY HERD.

Following is the record for the herd for the past year, the cows being arranged in order of production of butter fat.

It will be noted that the profit per cow is much less than that shown in some previous reports, and this is accounted for by the fact that we had to do more supplementary feeding through the summer than ever before and feed was very high in price.

In the column denoting breed, A stands for Ayrshire, H for Holstein, J for Jersey, and G for grade:

HERD RECORD, NOVEMBER 1, 1910, TO OCTOBER 31, 1911.

Cow.	Breed.	Age Nov. 1, 1910.	Number of days of milking.	Pounds of milk.	Average percentage of fat in milk.	Pounds of fat in milk.	Pounds of butter, adding ⅛ fat.	Value of fat at 25c. per pound.	Cost of feed.	Profit over cost of feed.
								$ c.	$ c.	$ c.
A. Mercena N.	H.	4	365	11,500	3.6	414.60	483.70	103.65	70.67	32.98
Molly N.	H.	6	352	11,834	3.3	392.3	457.60	98.06	75.39	22.67
Rose	A.	7	365	9,042	4.3	390.98	456.14	97.74	62.86	34.88
Boutsje	H.	8	240	11,760	3.2	374.17	436.53	93 58	69.35	24.19
Tibby	A.	5	292	7,961	4.1	331.27	386.48	82.82	60.10	22.72
Beauty	H.	6	268	10,591	3.1	329.17	384.03	82.29	64.36	17.93
Toitilla	H.	9	296	9,006	3.6	324.29	378.34	81.07	52.94	28.13
Molly D.	H.	9	265	9,885	3.2	319.48	372.72	79.87	64.87	15.00
Ramona	J.	9	279	7,420	4.1	305.32	356.21	76.33	50.95	25.38
Blackie	G.	8	245	8,606	3.4	293.62	342.55	73.40	57.11	16.29
Aggie	J.	9	304	6,031	4.8	292.89	341 70	73.22	52.43	20.79
Dolly	J.	8	267	6,786	4.2	289.20	337.40	72.30	54.90	17.40
Molly R.	H.	2	286	7,385	3.6	269.48	314.39	67.37	57.22	10.15
Margaret C.	H.	5	275	7,359	3.5	257.68	300.62	64.42	57.39	7.03
Queenie	J.	12	278	5,327	4.7	253.72	296.01	63.43	49.76	13.67
Dainty	A.	11	276	6,814	3.6	243.88	284.52	60.97	54.20	6.77
Inka	H.	11	304	7,062	3.4	241.05	281.22	60.26	60.16	.10
Springwood	H.	7	280	7,603	3.2	240.98	281.14	60.24	59.71	.53
Bud	A.	7	247	6,274	3.8	238.81	278.61	59.70	36.30	23.34
Mercena N.	H.	6	229	7,293	3.2	232.68	271.46	58.17	56.89	1.28
Dainty O.A.C.	A.	2	256	5,425	4.1	225.28	262.82	56.32	43.10	13.22
Floss	A.	4	240	6,012	3.7	222.80	259.93	55.70	34.45	21.25
Dreamy	J.	5	283	4,508	4.9	221.84	258.81	55.46	49.78	5.68
Nancie	A.	10	296	5,654	3.9	219.46	256.03	54.86	39.65	15.21
Cherry	A.	3	358	5,631	3.8	217.72	254.00	54.43	40.54	13.89
Rose 3rd	A.	5	258	5,968	3.3	198.10	231.11	49.52	37.10	12.42
Mercena R.	H.	2	260	4,903	3.7	184.20	214.90	46.05	52.93	6.88

Farm Crops.

The summer of 1911 was extremely dry and the crops, on the whole, were the most unsatisfactory that I have seen since taking charge of the farm. All crops were much below the average, and the sample of grain is unsatisfactory, owing to the fact that it ripened too quickly.

Live Stock.

We are carrying a fairly heavy stock and the shortage of feed makes it somewhat difficult to hold the stock in satisfactory condition. The pasture was very poor owing to dry weather and necessitated considerable feeding during the latter part of the summer, which has added materially to the cost of maintaining the stock.

I would like once more to call attention to the urgent need for a new dairy stable, as our work with dairy cattle is very seriously hampered by prevailing conditions.

Experiments with Dairy Cattle.

During the past year we have made some investigations with Soya Bean Meal, Dried Brewers' Grains, and Cottonseed Meal. These foods were fed in comparison with bran, which is a well known feed for cows, and in all cases they were combined with Molac Dairy Feed.

The Soya Bean Meal came from England and is the by-product of the soya bean after the oil is extracted. Dried Brewers' Grains and Cottonseed Meal are foods already fairly well known.

Analyses made by Professor Harcourt, of the Chemical Department, show the following composition for Soya Bean Meal, Dried Brewers' Grains, Cottonseed Meal, and Molac.

	Protein.	Moisture.	Ash.	Fat.	Crude Fibre.	Carbo-hydrates.
	%	%	%	%	%	%
Soya Bean Meal (coarse ground)....	41.5	8.98	5.77	2.17	7.87	33.71
Dried Brewer's Grains.....	20.3	7.61	3.5	6.12	18.8	43.67
Cottonseed Meal	35.5	7.04	6.0	10.61	14.81	26.04
Molac Dairy Feed	14.57	7.95	5.92	3.71	13.44	54.41

It will be noted by the analysis that Soya Bean Meal contains a very high percentage of protein and a low percentage of crude fibre, which indicates a high feeding value for dairy cows and places it in the same class of feeds as high-grade cottonseed meal.

The Dried Brewers' Grains show a good percentage of protein, higher than is found in bran, but the percentage of crude fibre also runs very high, which tends to reduce the value of the food, so that Dried Brewers' Grains may be counted in about the same class as bran.

The Cottonseed Meal used in this experiment shows a lower percentage of protein than is called for in a high-grade Cottonseed Meal, which should run anywhere from 43 to 48 per cent. of protein. This Cottonseed Meal, therefore, belongs to only the medium grade of this product.

Molac Dairy Feed belongs to the same class of foods as bran, being very similar to bran in composition.

Dried Brewers' Grains vs. Bran.

Eleven cows were used in this test. They were fed for two weeks upon bran and Molac as their concentrated food, then for two weeks upon Dried Brewers' Grains and Molac, followed by a two week period upon bran and Molac. In making comparisons, the second week of the first period and the second week of the third period are averaged and compared with the second week of the middle period.

The cows received from eight to twelve pounds of concentrates per day, the concentrates being made up of equal parts by weight of Molac and bran during two of the periods, and Molac and Dried Brewers' Grains during the other period. The bulky part of the ration was the same for all cows and consisted of mixed hay, straw, silage, and roots.

Table I. which follows gives the milk yield, per cent. of fat, and total pounds of fat produced by each cow during the second week of each period, and shows the average milk and total fat produced by each cow during the second weeks of Periods 1 and 3.

TABLE I.

Showing results of 2nd week of each Period.

No. of Cow.	2nd week. Period I. Bran and Molac.			2nd week. Period III. Bran and Molac.			Average of Periods I. & III. Bran and Molac.		2nd week. Period II. Dried Brewers' Grains and Molac.		
	Lbs. Milk.	% Fat.	Lbs. Fat.	Lbs. Milk.	% Fat.	Lbs. Fat.	Lbs. Milk.	Lbs. Fat.	Lbs. Milk.	% Fat.	Lbs. Fat.
110.....	373	3.4	12.68	344	3.0	10.32	358.5	11.50	354	3.2	11.32
111.....	241	3.7	8.91	251	3.3	8.28	246.	8.59	247	3.1	7.65
118.....	209	4.4	9.19	205	4.3	8.81	207.	9.00	216	4.1	8.85
120.....	225	3.9	8.77	227	3.7	8.39	226.	8.58	245	3.5	8.57
123.....	105	5.4	5.67	97	5.4	5.23	101.	5.45	105	5.4	5.67
127.....	155	3.4	5.27	141	3.5	4.93	148.	5.10	155	3.2	4.96
128.....	245	3.6	8.82	228	3.5	7.98	236.5	8.40	242	3.5	8.47
136.....	170	4.7	7.99	171	4.6	7.86	170.5	7.92	186	4.2	8.65
141.....	113	3.7	4.18	113	4.0	4.52	113.	4.35	122	3.7	4.51
142.....	184	3.8	6.99	185	3.8	7.03	184.5	7.01	198	3.9	7.72
149.....	191	3.8	7.25	182	3.9	7.18	186.5	7.21	184	3.8	6.99
Totals.....	2,211	.....	85.72	2,144	.....	80.53	2,177.5	83.11	2,254	.....	83.36

The table shows that nine out of the eleven cows gave an increased milk production upon Brewers' Grains, and that only two of the cows showed a decrease, the decrease being very small.

As to the fat, there is a slight increase on Brewers' Grains, but owing to the fact that the per cent. of fat in milk is extremely variable, even upon the same feed, we feel safer in basing our comparison upon the milk yield, rather than upon the fat.

The general result of this test, therefore, indicates that Dried Brewers' Grains used in this test have a higher feeding value than bran for purposes of milk production, the increase in milk production upon Dried Brewers' Grains amounting to about three and a half per cent.

Cottonseed Meal vs. Bran.

In this comparison, Molac was also used during each period, but owing to the high protein content of cottonseed meal, we used only half as much cottonseed meal as we used of bran. Four of the cows received four pounds of Molac and four pounds of bran each per day during the first and third periods, and four pounds of Molac and two pounds of cottonseed meal during the second period. Five other cows received five pounds of Molac and five pounds of bran during periods 1 and 3, and five pounds of Molac and two and a half pounds of cottonseed meal during Period 2. The remaining cows received six pounds of Molac and six pounds of bran during Periods 1 and 3, and six pounds of Molac and three pounds of Cottonseed Meal during Period 2.

TABLE II.

Showing results of 2nd week of each Period.

No. of Cow.	2nd Week. PERIOD I. Bran and Molac.			2nd Week. PERIOD III. Bran and Molac.			Average of PERIODS I. & III. Bran and Molac.		2nd week. PERIOD II, Cottonseed Meal and Molac.		
	Lbs. Milk.	% Fat.	Lbs. Fat.	Lbs. Milk.	% Fat.	Lbs. Fat.	Lbs. Milk.	Lbs. Fat.	Lbs. Milk.	% Fat.	Lbs. Fat.
110.....	344	3.0	10.32	310	3.1	9.61	327.	9.96	321	2.9	9.31
111.....	244	4.6	11.22	257	3.6	9.25	250.5	10.23	269	3.2	8.60
118.....	205	4.3	8.81	192	4.6	8.83	198.5	8.82	203	4.1	8.32
120.....	236	3.8	8.96	240	3.8	9.12	238.	9.04	240	4.0	9.60
123.....	107	5.2	5.56	105	5.5	5.77	106.	5.66	105	5.2	5.46
127.....	158	3.4	5.37	159	3.3	5.24	158.5	5.30	161	3.6	5.79
128.....	264	3.8	10.03	252	3.5	8.82	258.	9.42	269	3.5	9.41
136.....	188	4.6	8.64	189	4.7	8.88	188.5	8.76	185	4.6	8.51
141.....	113	4.0	4.52	115	3.8	4.37	114.	4.44	117	3.5	4.10
142.....	185	3.8	7.03	186	3.7	6.88	185.5	6.95	197	3.6	7.09
149.....	210	3.7	7.77	191	3.8	7.25	200.5	7.51	198	3.7	7.32
Totals.....	2,254	.....	88.23	2,196	.....	84.02	2,225.	86.09	2,265	.....	83.51

In reckoning results, we took the average of the second weeks of Periods 1 and 3 against the second week of Period 2, as in the previous test.

Table II. shows the milk and butter fat produced per week by each cow, and gives the average of the second weeks of Periods 1 and 3.

In this test four of the cows show a slightly lower milk production during Period 2 when Cottonseed Meal was fed, the remaining seven showing a larger production on Cottonseed Meal. The total milk produced is slightly higher on Cottonseed Meal than on bran.

A curious feature is that while the milk production is higher on Cottonseed Meal, the total fat produced is lower. In a short test of this kind, however, the fat is an unreliable indication of the relative value of foods, and consequently it is safer to compare the foods on the basis of milk production.

According to this test, therefore, Cottonseed Meal proved quite equal to twice its weight of bran, when used as a supplement to other meal in the ration of a dairy cow.

Soya Bean Meal vs. Bran.

In this test, eleven cows are also used and the plan of the experiment is identical with that of Cottonseed Meal. Soya Bean Meal, being high in protein, was used to displace twice its weight of bran.

Comparisons are based on the same periods as in the previous two tests.

TABLE III.

Showing results of 2nd week of each Period.

No. of Cow.	2nd Week. Period I. Bran and Molac.			2nd week. Period III. Bran and Molac.			Average of Periods I. & III. Bran and Molac.		2nd Week. Period II. Soya Bean Meal and Molac.		
	Lbs. Milk.	% Fat.	Lbs. Fat.	Lbs. Milk.	% Fat.	Lbs. Fat.	Lbs Milk.	Lbs. Fat.	Lbs. Milk.	% Fat.	Lbs. Fat.
110.....	310	3.1	9.61	280	3.0	8.40	295.	9.00	311	2.8	8.71
111.....	257	3.6	9.25	241	3.7	8.91	249.	9.08	253	3.4	8.60
118.....	192	4.6	8.83	173	4.6	7.96	182.5	8.39	190	4.3	8.17
120.....	240	3.8	9.12	225	3.9	8.77	232.5	8.94	247	3.5	8.64
123.....	105	5.5	5.77	105	5.4	5.67	105.	5.72	104	5.0	5.20
127.....	159	3.3	5.24	155	3.4	5.27	157.	5.25	166	3.3	5.48
128.....	252	3.5	8.82	245	3.6	8.82	248.5	8.82	243	3.5	8.50
136.....	189	4.7	8.88	170	4.7	7.99	179.5	8.43	182	4.3	7.82
141.....	122	3.7	4.51	113	3.7	4.18	117.5	4.34	114	3.6	4.10
142.....	184	3.8	6.99	184	3.8	6.99	184.	6.99	185	3.6	6.66
149.....	231	3.8	8.78	210	3.7	7.77	220.5	8.27	221	3.5	7.73
Totals	2,241	.....	85.80	2,101	.....	80.73	2,171.	83.23	2,216	.....	79.61

Table III. shows details of the different periods and shows the average milk and fat produced per cow during the second weeks of Periods 1 and 3, and the second week of Period 2. It is also to be seen that three of the cows show a slight decrease in milk on Soya Bean Meal, but the remaining eight cows gave more milk on Soya Bean Meal than on bran.

As in the case of Cottonseed Meal, there is a slight increase in the total milk produced on Soya Bean Meal, but a decrease in the amount of fat. As stated before, however, we do not regard the fat as a reliable indication of relative feeding value.

In this test we find that Soya Bean Meal gave a result almost identical with that of Cottonseed Meal, and demonstrated the fact that Soya Bean Meal is equal in feeding value to at least twice its weight of bran.

It is interesting to note that the composition of these foods, as shown by the analysis, gives a very fair indication of their relative feeding value.

Alfalfa Hay as a Substitute for Meal.

In this test nineteen cows were employed. From November 1st to 18th, inclusive, these cows were fed a ration of mixed hay, straw, silage, and a meal ration which we believed necessary to maintain a reasonable flow of milk. The meal ration varied in individual cases, as the tables which follow show. On November 19th we changed the bulky ration to alfalfa hay and silage, and made a very material cut in the amount of meal. The alfalfa feeding covers a period of three weeks and is called Period 2 in the tables. We are able, therefore, to compare the average daily milk yield during the eighteen days which constitute Period 1 with the twenty-one days which consitute Period 2. The tables show the length of time each cow had been milking previous to November 1st, her average daily milk yield from November 1st to 18th inclusive (which we call Period 1), and her average daily milk yield from November 19th to December 9th, inclusive, which we call Period 2 and which covers the period of alfalfa feeding.

Group I. which follows is made up of five of our larger Holstein cows. These cows were comparatively fresh and were giving a fairly heavy flow of milk, and consequently were receiving what we call a full meal ration. It will be noticed that during Period 1 they were receiving 4.5 pounds of bran, 3 pounds of cottonseed meal, and .5 pound of oil cake, or a total of 8 pounds of meal per day. During Period 2 the meal ration is cut down to three pounds of cottonseed meal, the balance of the ration being made up of alfalfa hay and silage. In other words, the meal ration has been reduced by four and a half pounds of bran and one-half pound of oil cake. The following table shows the result obtained under the change:

Group I.—Holstein.

Cow.	Days Since Calving.	Period I. Nov. 1 to 18, inclusive, 18 Days.	Average Milk per day. Period I.	Period II., Nov. 19 to Dec. 9th, inclusive, 21 Days.	Average Milk per day. Period II.
	Days.		Lbs.		Lbs.
No. 142	18	Mixed hay, 17 lbs. Straw, 4 lbs. Silage, 25 lbs. Bran, 4.5 lbs. Cottonseed meal, 3 lbs. Oil cake, 0.5 lb.	45.6	Alfalfa hay, 25.5 lbs. Silage, 35 lbs. Cottonseed meal, 3 lbs.	43.4
No. 109	161	"	35.5	"	34.
No. 76	130	"	38.6	"	39.2
No. 143	140	"	40.4	"	40.4
No. 141	34	"	39.2	"	38.

Referring to the table, we find that one cow actually increased in milk flow during the second period. Another cow gave exactly the same daily milk yield, and the remaining three decreased very slightly, the decrease being not more than the normal decrease due to advancing lactation.

In this group, therefore, the alfalfa hay successfully maintained the milk flow under a reduction of five pounds of meal per cow per day, which is a very material decrease in meal required.

It is possible that the meal ration might have been reduced still further, but this point must remain for further investigation.

Group II. also comprises five Holstein cows, but they were somewhat lighter cows than those in Group I., and some of them had been milking for a long period. The meal rations fed these cows varied considerably. Nos. 119 and 159 were getting the same rations as the cows in Group I., but the other three cows were receiving less meal during Period I.

It will be noticed in the table that cow No. 111 was fed no meal during Period 2. Nos. 86, 119, and 159 received the same meal ration during Period 2 as the cows of Group I., and No. 120 received only two pounds of cottonseed meal per day during Period 2. The following table shows results with Group II.:

GROUP II.—HOLSTEIN.

Cow.	Days Since Calving.	Period I. Nov. 1 to 18, inclusive, 18 Days.	Average Milk per day. Period I.	Period II.—Nov. 19 to Dec. 9th, inclusive, 21 Days.	Average Milk per day. Period II.
	Days.		Lbs.		Lbs.
No. 111	354	Mixed hay, 17 lbs. Straw, 4 lbs. Silage, 25 lbs. Bran, 2.6 lbs. Cottonseed meal, 1.8 lbs. Oil cake, 0.5 lb.	18.8	Alfalfa hay, 25 lbs. Silage, 35 lbs. No meal.	17.2
No. 86	157	Roughage as above. Bran, 2.66 lbs. Cottonseed meal, 2 lbs.	29.2	Roughage as above. Cottonseed meal, 3 lbs.	27.3
No. 119	127	Roughage as above. Bran, 4.5 lbs. Cottonseed meal, 3 lbs. Oil cake, 0.5 lb.	34.1	Roughage as above. Cottonseed meal, 3 lbs.	34.5
No. 159	38	Roughage as above. Bran, 4.5 lbs. Cottonseed meal, 3 lbs. Oil cake, 0.5 lb.	29.6	Roughage as above. Cottonseed meal, 3 lbs.	29.5
No. 120	356	Roughage as above. Bran, 2.66 lbs. Cottonseed meal, 2 lbs.	26.1	Roughage as above. Cottonseed meal, 2 lbs.	26.2

Cow No. 111 is of especial interest. This cow had been milking for a long time and was not giving a large amount of milk. During the second period she was fed no meal, yet during this period of three weeks she maintained her milk flow quite as well as during the period when she received nearly five pounds of meal per day, making a slight allowance for natural decrease due to advancing

lactation. Three of the cows in this group gave practically the same amount of milk per day during both periods, and the remaining two cows have held their own during Period 2.

As in the cases of Group I. this group also indicates that alfalfa hay is able to supplant a considerable amount of meal in the ration of a cow, and in the case of a cow well advanced in lactation it will supplant the total meal ration.

Group III. was made up of Jerseys, which, owing to their smaller size, took a somewhat lighter ration. The table which follows shows the rations which were used during both periods, and the average daily milk flow of each cow during these periods. It will be noticed that two of these cows received no meal during the second period.

GROUP III.—JERSEYS.

Cow.	Days since calving.	Period I, Nov. 1 to 18, inclusive, 18 days.	Average milk per day. Period I.	Period II. Nov. 19th to Dec. 9th, inclusive, 21 days.	Average milk per day. Period II.
	Days.		Lbs.		Lbs.
No. 131.	280	Mixed hay, 15.5 lbs. Straw, 4 lbs. Silage, 25 lbs. Bran, 1.5 lbs. Cottonseed meal, 1.5 lbs.	15	Alfalfa hay, 22 lbs. Silage, 25 lbs. No. meal.	12
No. 130.	203	Mixed hay, 15.5 lbs. Straw, 4 lbs. Silage, 25 lbs. Bran, 1.5 lbs. Cottonseed meal, 1.5 lbs.	14.9	Alfalfa hay, 22 lbs. Silage, 25 lbs. No meal.	14.1
No. 138.	138	Roughage as above. Bran, 2.6 lbs. Cottonseed meal, 1.8 lbs. Oil cake, 0.5 lb.	23.8	Roughage as above. Cottonseed meal, 1 lb.	25.3
No. 123.	40	Roughage as above. Bran, 2.6 lbs. Cottonseed meal, 1.8 lbs.	21.1	Roughage as above. Cottonseed meal, 1 lb.	19.1
No. 132.	139	Roughage as above. Bran, 2.6 lbs. Cottonseed meal, 1.8 lbs. Oil cake, 0.5 lb.	22.6	Roughage as above. Cottonseed meal, 1 lb.	21.

Cows 131 and 130 received no meal during the second period, yet it will be seen that they have maintained their milk flow quite up to what might have been expected had the rations been the same.

The remaining three cows were reduced to one pound of cottonseed meal per day. One of these cows gave a higher average daily milk yield during Period 2, and the other two each held their own, the decrease being not more than normal.

In this group, therefore, the indications as to the value of alfalfa are exactly the same as in the two preceding groups.

Group IV. contained four Ayrshire cows, two of which had been milking for a long period. Two of these cows received no meal during the second period, and the other two received a very light ration of cottonseed meal.

It will be noted that of the two cows which received no meal during the second period, one of them gave a slightly higher average milk yield during the second period, and the other held her own. In the case of the other two cows, the milk yield has been well maintained during the second period, the decrease being not more than normal.

According to investigations of American Experiment Stations, the normal monthly decrease in the milk flow varies from 5.8 to 12.3 per cent., depending mainly upon the length of time the cow has been milking, the smaller shrinkages occurring in fresh cows and the larger in cows which have been milking for nine or ten months.

GROUP IV.—AYRSHIRES.

Cow.	Days since calving.	Period I. Nov. 1 to 18, inclusive, 18 days.	Average milk per day. Period I.	Period II. Nov. 19 to Dec. 9th, inclusive, 21 days.	Average milk per day. Period II.
	Days.		Lbs.		Lbs.
No. 118.	32	Mixed hay, 15.5 pounds straw, 4 lbs. silage, 25 lbs. bran, 3.5 lbs. cottonseed meal, 2 lbs.	31.3	Alfalfa hay, 23 pounds silage, 25 lbs., cottonseed meal, 3 lbs.	30.4
No. 135.	144	Roughage as above, bran 2.6 lbs., cottonseed meal, 1.8 lbs., oil cake, 0.5 lb.	21.7	Roughage as above, cottonseed meal, 1 lb.	20.2
No. 156.	258	Roughage as above, bran 1.5 lbs., cottonseed meal, 1.5 lb.	14.6	Roughage as above. No meal.	15.
No. 136.	365	Roughage as above, bran 1.5 lbs., cottonseed meal, 1.5 lb.	16.	Roughage as above, No meal.	15.1

If we examine our results, therefore, in the light of these figures, it will be found that in no case has the decrease (where decreases have occurred) exceeded what might be expected under normal circumstances when a cow is receiving a sufficient quantity of food.

The four groups contain nineteen cows, and it is certainly remarkable that every cow, without an exception, has maintained her milk flow up to the normal point under the change in rations.

Our results indicate that cows which are not producing heavily may be held to their normal milk yield without a meal ration, provided a reasonably good quality of alfalfa hay is fed. In order to hold a large producer up to her milk flow, no doubt it would be neecssary to feed a meal ration, but in the case of cows giving less than thirty pounds of milk per day it is questionable whether the feeding of a meal ration would be found profitable when first-class alfalfa hay is fed. It is quite possible that cows giving less than forty pounds of milk per day could be held to their milk flow without a meal ration, but this is a point which requires further investigation.

In the light of these tests, the possibilities of alfalfa hay as a means of saving meal appear to be very great.

Experiments in Swine Feeding.

During the summer of 1911, we commenced certain investigations with swine which are not by any means complete. Until further work is accomplished, we do not think it would be wise to give the details of the work. Certain things, however, have been indicated, and following are some of the points which seem to stand out most clearly in connection with this year's work.

(1) Granted that pigs are healthy, the main cause of lack of growth and thrift in young pigs after weaning is a lack of protein, or muscle-forming constituents, in the food.

(2) Wheat middlings, which are most commonly used for young pigs at this time, do not supply sufficient protein in themselves to meet the requirements of the young pig.

(3) Skim milk at twenty cents per hundredweight proved a very cheap source of protein.

(4) Oil cake proved fairly effective, but at $36.00 per ton it was more expensive than skim milk at twenty cents per hundredweight.

(5) In the absence of skim-milk, ground oil cake (linseed meal) proved fairly satisfactory, and may constitute at least ten per cent. of the total meal ration.

(6) It does not seem possible to furnish young pigs with sufficient protein with wheat middlings and farm grown grains alone.

(7) Owing to the fact that low-grade flour contains less fibre than wheat middlings, it is often recommended for use with middlings for young pigs. This year's test, however, indicates that the use of low-grade flour was unprofitable, due, no doubt, to the fact that low-grade flour contains less protein than wheat middlings.

(8) A liberal supply of protein in the ration of the pig is especially important up to the time it is five or six months old. After the pig is six months old, it appears to thrive upon a ration containing a much smaller per cent. of protein and consequently of a more fattening character.

(9) The amount of water supplied to a pig is an important factor in affecting its thrift. In cases where the meal is mixed with water, it is possible to feed too much water for the best results. The practice of mixing meal with water into a thin slop is not to be recommended, as it compels the pig to consume more water in some cases than he actually requires.

(10) Our best results were obtained from mixing the meal with just enough water to make a very thick slop, and then allowing the pig access to water, which he will drink at will. Pigs fed in this way, consumed considerably more water than they received in their feed, especially during hot weather, and it is probable that the better results from this method of feeding were due to the fact that the pig took much of this extra water on a comparatively empty stomach, and consequently the food was not unduly diluted with water as in cases where the meal was made into a thin slop.

We hope to carry these investigations further before the close of another year.

Respectfully submitted.

G. E. DAY.

PART X.

PROFESSOR OF POMOLOGY.

To the President of the Ontario Agricultural College:

SIR,—I beg to submit herewith report of the Department of Pomology for the year 1910-11.

The courses of lectures given by this Department have been subject to no important change during the past year, except such repetition as has been made necessary due to increased size of classes. We find it necessary to repeat our practical work with the First Year four times and to repeat lectures twice. The Second Year class is now entirely over-taxing the accommodation of our class-room, and it will be necessary for us to divide this class also into two sections for lecture work, and into three or four sections for afternoon work. It will easily be seen that our teaching work requires at present a great deal more time than formerly, although no more ground is being covered.

Nine specialists in Horticulture were graduated this past year. Three of the number are at present engaged in fruit growing: the remainder have accepted positions of various kinds, all of them at good salaries.

The third annual Short Course in Fruit Growing was held from January 24th to February 3rd, 1911, and the attendance (which exceeded one hundred and fifty) is an indication of the appreciation with which this course is meeting. It has been a particularly difficult matter to stretch the accommodation of our class-room and buildings so as to take care of a class of this size.

This department is of the opinion that an extension of this course to four weeks would greatly increase its value, and we should like to carry out this change next year if satisfactory arrangements can be made. Heretofore, we have dealt almost entirely with fruit growing, but we believe that a large number of students could be enrolled in a course which would deal with general Horticulture, although fruit growing would continue to be the leading subject.

We ran last winter, simultaneously with the Short Course, a school of instruction in the box packing of apples. The course was divided into two sections of one week each. During the first week we had a class of twenty, which was felt to be the limit that could be handled by one instructor. During the second week, however, we made room for a number more and enrolled a class of twenty-five. Mr. S. G. Campbell, of Hood River, Oregon, was brought east especially to take charge of this class, and gave the very best satisfaction throughout. In this connection, I beg to bring to your notice a resolution passed by the Ontario Fruit Growers' Association in session at Toronto, asking for an enlargement of this course and for the giving of instruction in barrel packing as well. So far as we are concerned, it is simply a question of finding suitable accommodation. The management of these classes does not draw heavily on our time, provided capable instructors can be had. There is no longer, we believe, any necessity for importing men from a distance, and we hope arrangements can be made which will enable us to put on two weeks of instruction in box packing and two weeks' of instruction in barrel making this coming year.

In March and April of last spring I attended Fruit Institute meetings and delivered addresses at the following places: Millgrove, Orono, Port Hope, Barrie, Oshawa, Simcoe. In July and August I assisted in orchard meetings at Goderich, in Huron County, and at Rednersville and South Bay, in Prince Edward County.

It was my pleasure to attend on August 29th and 30th, the annual summer meeting of the Pomological and Fruit Growing Society of the Province of Quebec, held at Inverness, Que. I delivered an address there, entitled "Observations on Temperature as Related to Fruit Growing."

I officiated as judge on plates and cones of apples at the November Show in Toronto in 1910, and at the Toronto Industrial in 1911 I acted in the same capacity as substitute for Mr. W. T. Macoun, Central Experimental Farm, Ottawa.

In October of the past year, at the request of the Department of Agriculture, I visited New York State in company with Mr. L. Cæsar, Lecturer in Economic Entomology, for the purpose of making a first hand study of the production of nursery stock in New York State.

In connection with the instruction of the Senior Class in Horticulture, I have made a number of excursions with the class to various localities of interest. The present class visited this fall the Niagara District, Norfolk County, and Newmarket. The management of Simcoe Fair, in Norfolk County, was kind enough to allow our senior students to judge their fruit exhibits under my direction. The class derived a great deal of valuable experience and instruction from this work and we hope in future years to have the opportunity of engaging in more work of this character.

The past season has been a most peculiar one from the standpoint of the fruit grower, in that rainfall has been decidedly deficient and, in addition, new records of high temperatures for this locality were established. The blooming season of tree fruits was very short indeed. All varieties came into bloom together and the entire blooming period did not cover more than five days. The abnormally warm summer season gave us fruit of unusual color and maturity. Our apple orchard set a good crop of fruit and the early varieties were harvested in good condition. A serious hailstorm in the latter part of August caused very serious damage and almost ruined our crop of fall and winter apples for commercial purposes.

Mr. A. H. MacLennan, who is in charge of Vegetable Gardening, states that the proper teaching of the subject is greatly hindered by lack of suitable accommodation for practical instruction. At the present time, there is, unfortunately, no space of any kind available. This department believes that there is sufficient call for experimental work in glasshouse vegetables and for instruction of students to warrant the construction of suitable greenhouses for this work.

In a dry season, such as the past, it was to be expected that outdoor vegetable crops would suffer more or less unless artificially watered. The benefits of irrigation were especially noticeable in the case of a small area of late celery planted under a section of Skinner irrigation system. We believe market gardeners require some such system as this as insurance against loss by drouth, and are having the greater part of our garden placed "under water" in readiness for succeeding summers.

In co-operation with the Department of Chemistry the main vegetable garden was plotted last spring for a systematic fertilizer test with truck crops. We hope to continue this line of work for a number of years, until definite results can be obtained. For further information concerning fertilizers, see "The Report of the Professor of Chemistry."

For report of work done in combating insect and fungus pests of the garden, see "The Report of the Professor of Entomology." Special attention is drawn to a successful method of combatting cabbage maggot.

Greenhouse Cucumbers.

Mr. MacLennan furnishes the following notes on new varieties tested for the first time:—

Isbell's Grand. Resembles Davis' Perfect but proved a heavier cropper.

Princess. Short, dark green, no spines; seed imported from Germany. A good cropper.

Montague's Greenhouse. Slightly shorter than Davis' Perfect; dark green, and as heavy a cropper.

The following table gives the results of 1911 crop from a bed 8 ft. x 54 ft. in size. (Twelve plants of Davis' Perfect were destroyed by eelworm in the middle of the season).

Number of plants.	Variety.	Number of fruits.	Average number per plant.
28	Davis' Perfect	588	21
16	Isbell's Grand	496	31
10	Vickery	230	23
8	Fiske (O. A. C.)	320	40
10	Montague	260	26
10	Vick (O. A. C.)	140	14
1	Rawson (O. A. C.) H.H.	28	28
1	Farquhar's Perfection (O.A.C.)	48	48
12	Noroton	240	20
12	Princess	216	18
32	O. A. C. Cross-bred	608	19
140		3,174	226

Greenhouse Tomatoes.

New Varieties: *Grand Rapids.* Pink, fine fruit, not quite as large as Globe, but more perfect in shape, and a heavier cropper.

London. Pink, resembles Earliana except in color; is a good cropper.

The following table, comparing yields from plants set 2 ft. x 2 ft. and 18 in. x 18 in. seems to indicate that the extra yield secured from close planting is a very small item. It is believed that 2 ft. x 2 ft. is the better distance, as the increase (32 lbs in this case) is secured at a considerably increased labor cost, owing to the closeness of planting.

Summer crop, 1911	280 plants	958 lbs. fruit
Summer crop, 1910	208 "	926 "
Increase	72 "	32 "

Respectfuly submitted,

J. W. CROW.

PART XI.

THE PROFESSOR OF LANDSCAPE GARDENING.

To the President of the Ontario Agricultural College:

SIR.—I have the honor to present herewith a brief report from the Department of Landscape Gardening for the year 1911.

It is hardly necessary to refer here to our teaching, other than to say that the regular courses of instruction have been given throughout the year as usual, to the long and short course classes, the normal teachers' classes, and the teachers in the summer school. The interest shown in the work has been gratifying, and the letters received from time to time form ex-students seeking advice on local problems indicate that a realization of the need of such instruction is being more and more widely felt.

The steadily growing interest in all kinds of civic and rural improvement is one of the strongest evidences of the progress and prosperity of our people. There are a great variety of organizations in this country which may, and many of which do, take an active interest in promoting work of this kind. Among these are the Farmers' and Women's Institutes, Horticultural and Local Improvement Societies, Boards of Trade and Education, Park Boards and Municipal Councils. During the past year, I have had the opportunity of assisting a number of these, and in several places helped to complete organizations which will continue the work. In this connection, I have addressed meetings at the following places: Agincourt, Berlin, Beachville, Brantford, Chatham, Caledonia, Chesterville, Durham, Grimsby, Goderich, Hamilton, London, Malvern, Milton, Newcastle, Niagara Falls, North Bay, Owen Sound, Queen's University, Kingston; Port Credit, Sudbury, Sault Ste. Marie, Toronto, Weston, and Wallaceburg.

If there is one place more than another where a general improvement and beautification is needed, it is on the school grounds throughout the whole Province in both town and country. As a rule, these grounds are the most neglected, untidy, barren places to be found in the community. That they should on the contrary be the most beautiful and best cared for centres is for many reasons clearly obvious to any one who appreciates the importance of environment in the education of the child. Make the school and its surroundings ideal, and it will show its effects in the homes of the next generation in a way that those of this generation hardly realize. Nor would we have to wait a whole generation for such results. Here is a field in which missionary work is needed to bring the great majority of school trustees to a realization of the opportunity which is theirs. This is not only an opportunity but a responsibility, which cannot be shifted from the shoulders of the trustees to the teachers, as some seem to think may be done. In Scarboro Township, the Women's Institute has begun a campaign for the improvement of all the school grounds in the township, and have held several public meetings to arouse an interest in the project. I visited three of these schools last Spring, and at the request of the trustees have had plans prepared which will enable them to carry on the work systematically. As such work is contagious, the other schools in the township will, no doubt, soon fall in line and keep up with this progressive movement.

We have visited about thirty schools this year and discussed with trustees ways and means for the improvement of their particular grounds. For most of these carefully prepared plans have been made which insure the work being carried on systematically and to a successful completion.

Among the places at which we have given assistance of this kind this year are the following: Berlin, Chatham, Cape Croker, Dunnville, Guelph, Morewood, North Bay, New Liskeard, New Toronto, Niagara Falls, Orillia, Oakville, Paris, Picton, St. Catharines, Sudbury, Sault Ste. Marie, Scarboro Township, Wheatley, and Winchester.

The management of the college campus, flower gardens and greenhouses comes under this department, and involves a good deal of care and close attention to details. To the credit of Mr. Wm. Squirrell, and Mr. Wm. Walker, foremen in charge of the grounds, it may be said that our campus never was more attractive than during the past year. The display on the grounds and in the greenhouses have been a source of pleasure and inspiration the year round to our students and visitors.

In the gardens and greenhouses a great variety of ornamentals have been tested. This branch of the work is under the immediate charge of Mr. Wm. Hunt, whose report follows:

Instruction in Floriculture.

The regular course of instruction as provided for in the College curriculum has been given to the first, second, and fourth year students. Instruction, with as much practical work as possible, was also given to the Macdonald classes, the spring class of Normal teachers, the summer class of school teachers, and to students from the City Model School and the Consolidated School.

Addresses, most of them illustrated, have been given at a number of Horticultural meetings during the year, and I have also acted as judge at horticultural exhibits, lawn and garden competitions, and Fall Fairs, at the following places: Elmira, Fergus, Hamilton, Brantford, Guelph, Tillsonburg, Hillsburg and Cayuga. Most of these meetings occur during July and August, between the regular college terms.

The Greenhouses.

Owing to the increasingly large classes, it becomes necessary each year to devote more space to provide material for the students' work, which of necessity gives less space for display and variety testing.

About fifty new varieties of Chrysanthemums have been tested during the past few years, and several varieties of special merit for home culture have been added to our collection. Those mentioned below make a choice selection for home culture:

Early Snow. A pure white flower, dwarf grower, free flowering, and early, in bloom, October 26th.

Golden Glow. The earliest yellow of all. Can be had in flower in August, September, or October, according to the treatment given it.

Glory of Pacific. A light pink variety. Free flowering. In bloom early in October .

Nellie Pockett. The flowers are large, of a rich cream color, and of Japanese type, the petals being beautifully curved and twisted. A good, sturdy growing variety. In flower about the end of October.

Pink Ivory. This is one of the best varieties to grow as a specimen plant. It is of dwarf habit, and produces its pretty shell pink blooms, that are almost globular in form, in great profusion. It flowers early in November.

F. S. Vallis. A large flowering Japanese variety that produces its large, pretty lemon-yellow flowers very profusely.

Geo. W. Childs. The blooms of this variety are of a bright crimson color, very distinct.

Snowdrop. This is one of the double pompon or daisy flowering type. Its flowers, which are produced in great profusion, are pure white when fully developed. It makes a beautiful appearance as a pot plant.

Julia Lagravere. One of the best of the dwarf-growing, dark colored, double pompon varieties, its color being a rich glowing crimson.

Klondike. This variety, as its name suggests, has flowers of deepest golden yellow color, large for a pompon variety.

Rosina. A dwarf-growing, single-flowering variety, very like the popular variety, Mizpah, in growth, of which it is a seedling. Its blossoms are, however, of a very light shade of rose pink, very dainty and pretty.

Miss A. Holden. This variety has rather large single flowers of delicate straw color, very pleasing and a rare shade of color.

New Hardy Perennials.

A number of varieties of hardy perennials that are not commonly grown have been added to our collection during the year. Among these the following have proved worthy of note:—

Anchusa Italica. (Dropmore variety). This is a much improved type of the ordinary Anchusa Italica. Height of plant three to four feet. Flowers a bright blue. A very conspicuous plant. Season of flowering, June, July, and a part of August.

Dianthus latifolius atrococineus, fl. pl. (Everblooming Sweet William). The rich crimson flowers of this plant and its continuous flowering habit, make it a valuable addition to these favorite border plants. It grows readily from seed or from division of the roots. Plants from seed sown indoors in March or April will flower the same season.

Primula cortusoides Sieboldii (Primula Sieboldii). A useful little border plant. Leaves large, rather coarse, and low growing. The flowers are produced numerously in umbels, and vary in color from pure white to white striped with carmine to rose color. Height of flower stem, eight to twelve inches. A useful plant for a not too sunny border.

Pentstemon lævigatus digitalis. This is not one of the most showy perennials. Its almost pure while flowers borne in a rather loose spike on a straight stem about two feet in height are, however, very acceptable in the border during July and August. It is usually catalogued as Pentstemon digitalis. This variety and P. barbatus Torreyii with its crimson scarlet flowers are both interesting plants for the perennial border.

Scabiosa caucasica (Caucasian Scabiosa). This is by no means a newly introduced plant, having been brought from the Caucasian Mountains in 1803. It is not as well known, however, as it deserves to be. Height about two feet. Has finely cut silvery foliage. Flowers shell-like and about one and a half inches in diameter, of a pale lavender blue color. It needs a well-drained, light, loamy soil to give the best results. There is a white variety, not so attractive as the blue.

Choice Hardy Perennials.

The following varieties of hardy perennials have been thoroughly tested in our borders and can be recommended as particularly desirable for a mixed flower border. The approximate height, with the method of propagation, and season of flowering is given as a guide to their arrangement in the border.

Perennial Climbers for Background, Growing 10 to 20 feet.

Ampelopsis quinquefolia (Virginia Creeper).
Ampelopsis hirsuta (Virginia Creeper). Clings to brick and stone walls
Aristolochia sipho (Dutchman's Pipe).
Clematis Jackmanni. Large-flowering. Violet purple.
Clematis Paniculata. Small-flowering. White.
Lonicera Hallenna (Japan Honeysuckle).

Hardy Perennials, 4 to 6 feet in Height:

Bocconia cordata (Plume Poppy). Division. July.
Boltonia asteroides (False Chamomile). Division. August.
Delphinium hybridum (Larkspur). Seed. June.
Helianthus, "Miss Mellish" (Single Sunflower). Division. July.
Rudbeckia lanceolata (Golden Glow). Division. July.
Valeriana officinalis (Garden Heliotrope). Division. June.

Hardy Perennials, 2 to 3 feet in Height:

Achillea, "The Pearl." Seeds or division. June.
Anthemis tinctoria Kelwayi (Yellow Marguerite). Seeds. June.
Aquilegia chrysantha (Golden Columbine). Seeds. May.
Aquilegia coerulea (Rocky Mountain Blue Columbine). Seeds. May.
Asters in variety (Michaelmas Daisy). Division. September.
Coreopsis lanceolata (Tickseed). Seeds. June.
Corydalis nobilis.. Seeds or roots. April or May.
Dielytra spectabilis (Bleeding Heart). Division. May.
Digitalis (Foxglove). Seeds (mostly biennial). June.
Gaillardia grandiflora (Blanket Flower). Seeds. June.
Gypsophila paniculata (Baby's Breath). Seeds or division. August.
Hemerocallis flava (Yellow Day Lily). Division. June
Iris Germanica (German Iris). Division. May and June.
Lilium Candidum (Madonna Lily). Bulbs. July.
Lilium elegans. Bulbs. July.
Lilium tigrinum (Tiger Lily). Bulbs. July.
Pæonia in variety (Pæony). Roots. June.
Papaver orientale (Oriental Poppy). Seeds. June.
Phlox, hybrid perennials in variety. Division. July.
Platycodon grandiflora (Chinese Bell Flower). Seeds. August.
Spiræa filapendula (Dropwort). Division. June.
Veronica in variety. Seeds or division. August.

Hardy Perennials, under 1 foot:

Bellis perennis (English Daisy). Seeds. November.
Cerastium tomentosum (Snow in Summer). Division. July.
Chionodoxa Luciliæ (Glory of the Snow). Bulbs. April.
Convallaria majalis (Lily of the Valley). Division. May.
Crocus in variety. Bulbs. April.
Dianthus barbatus (Sweet William). Seeds. June.
Heuchera sanguinea (Alum Root). Seeds. June.
Narcissi in variety. Bulbs. May.
Papaver nudicaule (Iceland Poppy). Seeds. May and September.
Phlox subulata (Moss Pink). Division. May.
Scilla sibirica (Squills). Bulbs. April.
Stachys lanata (Woundwort). Division. Foliage, all summer.
Tulips in variety. Bulbs. May.
Veronica Alpina. Seeds or division. June.
Vinca minor (Periwinkle or Trailing Myrtle). Runners. May.
Viola cornuta (Tufted Pansy). Seeds or division. April and June.

Paeonies.

A collection of about sixty varieties of these popular, hardy, garden flowers has been under test for the past two or three years. These plants were in full bloom during the June excursions, and were greatly admired. The following is a list of twelve of the best kinds, selected to cover the flowering season from early to late and give variety in color. These can be had from most nurserymen, seedsmen, or florists at reasonable prices. The best time to plant is in October.

White:
Couronne d'Or.
Festiva Maxima.
La Tulipe.
Duchesse de Nemours (Sulphur White).

Red:
Felix Crousse.
Rubra superba.

Deep Pink and Rose:
Mme. Geissler.
Modeste Guerin.

Pink and Light Pink:
Achille.
Claire Dubois.
Jeanne d'Arc.
Mons. Jules Elie.

Climbing and Pillar Roses.

A thorough test of about thirty of the best known kinds of climbing roses has been made during the past four years. The test has been conducted to ascertain whether there are any varieties that would endure successfully the severe winters of the northern section of the Province without protection. The plants are in the open garden which is only slightly sheltered by a windbreak some distance away.

The bushes are trained fan-shape on a wire trellis about five feet in height, the canes being left on the trellis all winter just as they were tied up in the summer. Among the thirty varieties tested, Queen Alexandria and May Queen proved the hardiest. Both of these came through the winters of 1907-8, 1908-9, 1909-10, in fairly good condition. But during the very severe winter of 1910-11, with its variable and extreme temperature and comparatively light snow falls, the variety May Queen was practically killed out, and the variety Queen Alexandra considerably weakened. Among the other varieties that were killed back to below the snow line, or in some instances killed quite to the ground, were the following:—

American Pillar, Ard's Rover, Baltimore Belle, Boule de Niege, Climbing Clotilde Soupert, Debutante, Dorothy Perkins, Gardenia, Lady Gray, Malmaison, May Queen, Mme. Alfred Carriere, Pearl Queen, Pink Roamer, Philadelphia Rambler, Prairie Queen, Prof. C. S. Sargent, Pink Rambler, Yellow Rambler, Wichuriana, Wm. C. Egan, and others.

The general conclusions drawn from the test are that in the northern sections of the Province, unless under very favored local conditions, all climbing or pillar roses are best taken from the trellis late in October and laid down as near the ground as possible. Before severe winter weather occurs a covering of four or five inches in depth of strawy manure, coarse litter, or green pine boughs should be put over them. This holds the snow during winter, and affords protection after the snow has disappeared in the spring.

The following varieties of climbing roses can be recommended as among the best for general culture:—

Crimson Rambler, double crimson; Dorothy Perkins, double pink; May Queen, double rose pink; Queen Alexandra, single pink.

Respectfully submitted,

H. L. HUTT.

PART XII.

THE PROFESSOR OF POULTRY HUSBANDRY.

To the President of the Ontario Agricultural College:

SIR,—I have the honour to present herewith the report of the Poultry Department for 1911.

A detailed report of the teaching, and lectures to Poultry Associations, Farmers' Clubs, and Farmers' Institutes is scarcely needed. These branches of our work are much the same from year to year, with the exception that the demand for lecturers during recent years has increased very much, and one man could be kept travelling from place to place during most of the fall and winter. With the present assistance given it is impossible to meet the demand for lecturers.

In April, last, M. C. Herner, B.S.A., was appointed as Demonstrator in Poultry Husbandry. Mr. Herner is a capable man, and performed his duties very satisfactorily. I was very sorry when he resigned to take charge of the Poultry Department at Manitoba Agricultural College.

THE STOCK.

It is gratifying to report that the stock in general has done very well this year, and shows a gradual improvement in egg production, as well as health and vigor. There has not been a year since I had charge of the Department, but what there has been some improvement. As far as egg production is concerned, this year has been much the best of any. There are no doubt, many factors that have influenced this. We are able to house the poultry better each year, and the method of feeding is suitable to our conditions. We have also been trap-nesting and breeding from our best producers for a number of years, which has helped materially, and moreover, last winter we were fortunate in having an exceptionally good feeder, in the person of A. A. Knight, who was very careful and used good judgment. The summer egg production was not as good as we had hoped for, owing to the excessive heat and dry weather.

EGGS.

As I said before, our hens laid exceptionally well during the winter and spring months, which helped in a great measure to fill the orders for eggs for hatching, which were very numerous indeed, in fact nearly double what they were in any previous year. In many instances we were unable to meet the demand owing to a shortage in the supply. The demand for the new laid egg for domestic use is also increasing, and we have no trouble in getting 35c. to 50c. respectively for October and November eggs.

Each year brings us more inquiries about egg farms, and hens that will lay a large number of eggs on the ordinary farm.

The production of eggs is profitable, especially where a reasonable number of eggs can be secured during the winter months, when eggs are high in price. To get from 30 to 50 per cent. egg yield from October 1st to the first of March requires good pullets, of laying strains, that are hatched between April 1st and

May 10th. A few days later than this, frequently mean as many weeks later in beginning to lay. It is of course necessary that the birds be well fed and properly housed.

Breeding for Eggs.

There is considerable inquiry in regard to eggs from good laying hens, and if these good layers transmit the power to lay eggs to future generations. There can be no doubt but what there is considerable difference of opinion among poultrymen, on this question. The only answer I can give to this question is the results obtained here.

It is necessary at the outset to say that we have not found all the hens laying above 150 eggs per year to be producers of good laying pullets, indeed six years ago, when we began breeding from the best layers, we found among them very many very poor breeders. Progress has been made only, by keeping the males as well as the females from hens whose offspring were good performers. Most of this work has been done with Barred Plymouth Rocks, although the other breeds have not been entirely neglected. I wish to say here, that if this work is to be continued, as in my opinion it should be, much more skilled labour will be required.

The keeping of the record of not only the egg production, but the hatching power of the eggs, and the vigour of the chicks from individual hens by the hundred, is no small task. These records to be of use must be accurate.

Thus far I have been able to give my personal attention to the breeding and record keeping, especially of the chicks, but next season, I cannot possibly hope to do this, as we have at least two hundred individual hens from whom good results may be expected.

On pages 156-7 of the College Report of last year was given an outline of a trial egg production between forty-six Barred Rock pullets, twenty-three of which were bred from the laying strain, and the remaining twenty-three were bred from a good exhibition strain of the same breed, where no particular attention was paid to laying qualities.

The following table gives the results for this year.

Egg Records of 23 Bred-to-Lay vs. 23 Exhibition Barred Rock Pullets.

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Total.
Exhibition pullets....	....	66	190	132	169	224	354	334	274	265	247	227	2,482
Bred-to-lay pullets....	101	337	296	179	201	308	396	449	323	324	288	312	3,514
	101	403	486	311	370	532	750	783	597	589	535	539	5,996

Feed Consumed by 23 Bred-to-Lay and 23 Exhibition Barred Rock Pullets.

	Whole Grain.	Rolled Oats.	Buttermilk.	Grit.	Oyster shell.
Exhibition pullets...	1,324 lbs.	762 lbs.	2,414 lbs.	34½ lbs.	41½ lbs.
Bred-to-lay pullets.	1,238 lbs.	502 lbs.	2,415 lbs.	25 lbs.	40 lbs.
	2,562 lbs.	1,264 lbs.	4,829 lbs.	59½ lbs.	81½ lbs.

The bred-to-lay pullets laid 1,032 more eggs than the exhibition pullets, but it will be noticed that the exhibition female ate more feed. This is probably due to the fact that they were larger birds. The bred-to-lay hens weigh from five to six pounds each, whereas the exhibition hens weigh from six to eight pounds each.

The bred-to-lay family mature earlier and the males reach a six pound weight in less time than the exhibition line, but when nine months old the exhibition males each weigh about one pound more.

In the bred-to-lay hen we lost five females during the year, one during December, one during April, two during May, and one during July. The first four pullets all died from having a yolk burst in the bowels, whether this in an hereditary weakness, or due to injury when being removed from the trap-nest, I am unable to answer. The hen that died in July, succombed to the excessive heat. All the hens died when they were laying almost daily.

In the exhibition pen, three females were lost, two during April, and one during June. These birds also suffered from ovarian trouble.

A word in reference to the individual records of the hens who completed the year, might not be out of place.

In the exhibition pen not one bird produced over 200 eggs during the twelve months. Five birds laid over 150 eggs each, and 10 birds laid over 100 eggs each, and under 150. Five birds laid less than 100 eggs each, laying, respectively, 95, 40, 21, 21, and 13.

In the bred-to-lay pen four birds laid over 200 eggs each, eleven birds laid over 150 eggs each, and under 200, and the remaining three birds laid respectively 145, 140, and 128 eggs.

Some people might consider that these were some bred-to-lay pullets that were especially selected, but below is given the results of all the bred-to-lay Barred Rock pullets that we had, which completed a year's record.

Egg Production from 53 Barred Rock Pullets, Bred-to-Lay, 1910-1911.

House No.	No. of Birds.	Total Eggs Laid.	Average Eggs per Hen.
4. A.....	19	3,405	179.2
4. B.....	16	2,633	164.5
5. A.....	18	3,166	175.8
	53	9,204	173.64

24.5 per cent. of the pullets laid over 200 eggs.
22.6 " " " 180 " and under 200 eggs.
20.7 " " " 160 " " 180 "
18.8 " " " 130 " " 160 "
3.7 " " " 120 " " 130 "
1.8 " " " 110 " " 120 "
7.8 " " under 100 "

13 of the pullets laid over 200 eggs.
12 " " 180 "
11 " " 160 "
10 " " 130 "
2 " " 120 "
1 " " 110 "
4 " below 100 " —39, 53, 83 and 98.

Egg Records of the 6 Best Hens from October 1, 1910, to October 1, 1911.

Leg Band No.	Eggs Laid.	Leg Band No.	Eggs Laid.	Average Egg Yield.
2,080	282	2,084	256	.....
2,064	268	2,058	256	259.5
2,097	243	2,079	252	.....

Feeding.

We are following very much the same method of feeding as we did last year, that is, we are using the staple foods such as wheat, corn, oats, buttermilk, roots, clover hay, waste cabbage, grit and oyster shell.

During the winter and summer months the foods that are kept constantly before the birds are rolled oats in hoppers, grit, oyster shell, and buttermilk. In summer the grain food consists of about 1-3 corn to 2-3 wheat fed in the litter night and morning. In winter the whole grain consists of equal parts of corn and wheat, and when the days are short it is thrown in the litter after the birds go to roost at night, and well forked over so that they have to work hard for it all next morning. At noon green food is given either in the form of clover hay, roots or waste cabbage, and at night the whole grain is fed in troughs, the birds being fed all they care to eat, and what is left is removed.

The cost of these feeds is figured at the following prices:—

Grain $1.50 per cwt. Beef scrap and green cut bone $3 per cwt. and buttermilk at 20c. per cwt. We get so much better results from feeding buttermilk as the only animal food, that we have almost discarded the use of beef scrap and green bone, except in experimental feeding.

In calculating the cost of feeding, and egg production, we divide the year into two parts; October 1 to March 1 for the winter months, as these are the hardest months in which to get eggs, and March 1 to September 1 for the summer months. September is used for stock-taking, house-cleaning, etc.

The following table gives the results from 341 females for 11 months:

Egg Production, Cost of Feeding, and Grain and Milk Consumed.

Collective results for 341 hens and pullets from October 1, 1910, to March 1, 1911.

Males.	Females.	——	Eggs laid.	Cost.	Average eggs per hen.	Lbs. grain consumed.	Lbs. milk consumed
2	55	Yearling B. Rocks....	1,638	$37 44	29.7	2,267	2,153
4	92	B. Rock pullets	4,415	61 10	47.9	3,598.5	4,165.5
5	60	Buff Orp. pullets.....	2,732	42 24	45.5	2,571	2,238.5
6	111	W. Leghorn pullets...	2,748	46 40	24.7	2,739	3,034
2	23	Minorca hens and pullets	40	13 36	1.73	823	609
19	341		11,573	$200 54	33.9	11,998.5	12,200

Collective results for 341 hens and pullets from March 1, 1911, to October 1, 1911.

Males.	Females.	——	Eggs laid.	Cost.	Average eggs per hen.	Lbs. grain consumed.	Lbs. milk consumed.
2	55	Yearling B. Rocks ...	4,323	$35 60	78.6	2,090	2,634
4	92	B. Rock pullets	7,513	60 22	81.6	3,444	5,034
5	60	Buff Orp. pullets.....	3,669	27 21	61.1	2,234	2,358.5
6	111	W. Leghorn pullets...	10,756	69 92	96.9	4,000	5,670
2	23	Minorca hens and pullets	1,686	18 40	73.3	1,051	1,508.5
19	341		27,947	$211 35	81.9	12,819	17,205

Collective Results for 341 Hens and Pullets for 11 Months, October 1, 1910, to September 1, 1911.

Males.	Females.	——	Eggs laid.	Cost.	Average eggs per hen.	Lbs. grain consumed.	Lbs. milk consumed.
				$ c.			
2	55	Yearling B. Rocks...	5,961	73 04	108.38	4,357	4,787
4	92	B. Rock Pullets.....	11,928	121 32	129.65	2,042.5	9,195
5	60	Buff Orp. pullets	6,401	69 45	106.68	4,805	4,597
6	111	W. Leghorn pullets..	13,504	116 32	121.65	6,739	8,704
2	23	Minorca hens and pullets	1,726	31 76	75.04	1,874	2,117.5
19	341		39,520	411 89	115.83	24,817.5	29,400.5

Average cost per dozen for winter months, 20.76 cents.
" " " " " summer months, 9.00 cents.
" " " " " eleven months, 12.48 cents.
Average cost of feeding each hen per month in winter, 11.76 cents.
" " " " " " " " " summer, 10.03 cents.
" " " " " " " " " for eleven months, 10.90 cents.

Average amount of grain consumed per bird (males included) in winter 33.3 lbs or 6.6 lbs. per month.

Average amount of grain consumed per bird (males included) in summer 35.6 lbs or 5.9 lbs. per month.

Average amount of grain consumed per bird (males included) in 11 mos. 68.9 lbs or 6.20 lbs. per month.

Animal Foods as they Affect Egg Production and the Hatching Qualities of the Egg.

An experiment was started two years ago, with the object of studying the effect that various kinds and quantities of animal foods might have upon the production and hatching qualities of eggs. The plan of the experiment was to use a different breed each year, and to continue the experiment for at least five years. It was thought, quite possibly, that the results would vary somewhat with the different breeds, and possibly with different families of the same breed.

Below is given the results of the first two years' work, that of 1909-1910 being carried on with Buff Orpington pullets, and that of 1910-1911 with Rhode Island Red hens and pullets.

There were twenty-five females and two males in each pen, and all housed in the same building. The grain and green food used were the same for each pen.

The animal foods are reckoned at the following prices:

Buttermilk 20c. per 100 lbs. Beef scrap $3.00 per 100 lbs. Green cut bone $3.00 per 100 lbs.

EXPERIMENTAL FEEDING WITH BUFF ORPINGTONS.

The following are the results for 7 months, from Oct. 1, 1909, to April 30, 1910.

Pen No.	Animal food used.	Lbs. whole grain.	Lbs. dry mash.	Lbs. animal food.	Total cost.	Total eggs laid.	Cost per dozen eggs.	Percentage of eggs hatched.
1.....	Buttermilk	720	233	1,453	$18 16	2,040	10.68	55.0
2.....	10 per cent. dry mash beef scrap	840	337	34	19 85	1,670	14.28	50.5
3.....	Beef scrap in hopper	900	216	141	22 21	1,664	15.84	33.0
4.....	No animal food	900	224	.....	17 99	1,496	15.48	59.5
6.....	Green cut bone.....	900	196	127¾	21 37	1,654	15.48	40.5

EXPERIMENTAL FEEDING WITH R. I. REDS.

The following are the results for 8 months, October 1, 1910, to May 31, 1911.

Pen No.	Animal food used.	Lbs. whole grain.	Lbs. dry mash.	Lbs. animal food.	Total cost.	Total eggs laid.	Cost per dozen eggs.	Percentage of eggs hatched.
1.....	Buttermilk	973	535	1,760.5	$25 60	1,762	17.43	57.0
2.....	10 per cent. dry mash beef scrap	898	553	61.5	23 06	1,320	20.96	56.4
3.....	Beef scrap in hopper.	907	510	106.0	23 92	1,625	17.66	51.6
4.....	No animal food.....	802	405	.....	17 70	730	29.09	66.25
5.....	Green cut bone.....	784	411	182.5	22 44	1,359	19.81	64.5

COMMENTS ON THE ABOVE TABLE.

It will at once be noticed that the eggs from the Rhode Island Reds cost considerably more than those from the Orpingtons. This should not be taken as a breed characteristic, as one half of the Reds were hens, and moreover the pullets were not as well matured when the experiment began.

With both breeds, buttermilk produced the most eggs at least cost.

Where beef scrap is fed in hoppers or where the birds can eat all they desire the Rhode Island Reds have done better than the Orpingtons, but the Orpingtons did much better than the Rhode Island Reds where no animal food was fed.

The pen fed upon green cut bone made relatively a better showing with the Reds than with the Orpingtons.

The hatching quality of the eggs appears to be much more seriously affected by the animal foods with the Orpingtons than it does with the Reds, but at the same time the general results would indicate that the best eggs for hatching are from birds receiving no animal food.

The results with the Rhode Island Reds, as far as hatching quality is concerned, may have been seriously affected by the fact that all the males used were full brothers, and bred from a hen whose eggs hatched exceptionally well. The

chicks hatched from the pens receiving the beef scrap in hoppers and the green cut bone had a higher percentage of mortality than those from the other pens.

Our observations have been that the Orpington eats much less green food than most birds, and requires less animal food. The beef scrap and buttermilk foods were continued with a small number of Orpingtons through the second generation, and the results corresponded with those obtained during the first year.

Poultry Houses.

A poultry house requires to be light and dry, and have abundance of fresh air without direct drafts over the birds, especially when roosting. It is necessary to construct poultry houses as cheaply as possible, consistent with efficiency.

The poultry plant has a great variety of houses, some of which are very expensive, being warm and tight with several thicknesses of lumber, while others are of only one thickness of lumber. Our experience has been that the inexpensive houses, give just as good and better results than the expensive ones, and they are certainly more easily manipulated. A full report of these is not needed here, as the same can be found in Bulletin No. 189. However, a word might not be out of place in reference to one of the newest types of houses, that is, the twenty by twenty open-front house. This house has the entire south side open to the weather, with the exception of the wire netting, which keeps the fowls in, and the sparrow etc. out. It is not claimed that this house is vastly superior to other types, but where one's time is fully occupied, and a cheap house is wanted, in which birds can be kept in good health with fair egg production, this house is worthy of a trial. In my opinion better results in egg production could be secured from this house during the winter months, if cotton screens were supplied to cover two-thirds of the open-front on stormy or very windy days. I would not recommend covering the entire front.

Table following gives the results of 100 hens of mixed breeding, practically some specimens of all the breeds we had. These were what would ordinarily be called the culls of the stock grown during 1910.

Egg Production and Cost of Feeding 100 Hens in Open-front House from November 7th, 1910, to June 7th, 1911.

Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	Total Eggs Laid.	Total cost.
175	786	774	806	1,449	1,873	1,273	139	7,275	$100.00

Feed Consumed by 100 Hens in the Open-front House for the Seven Months.

Whole Grain.	Rolled Oats.	Buttermilk.	Cost per doz. Eggs.	Average Eggs per hen.	Average cost per hen per m'th.
3,492 lbs.	1,826 lbs.	6,713 lbs.	16.50c.	72.75	14c.

N.B.—These figures do not take into account green food, grit and oyster shell.

Hatching and Rearing.

The production of eggs that will hatch a high percentage of chicks of high vitality is not an easy thing. Last season many poultrymen throughout the Province experienced considerable difficulty in getting good hatches. Apparently the weather for the preceding months or weeks has some influence as well as the foods given, method of housing and the pedigree of the birds.

The eggs produced at this department hatched very well, that is to say would hatch for the most part better than fifty per cent. when incubated in machines operated by students. Nearly all our hatching is now done by students.

We hatched eggs in the months of December, January, March, April and May by the artificial process. The December eggs hatched better than the January eggs, March eggs were the poorest and May eggs the best.

We have found year after year that one cannot be too careful in the selection of the males for breeding purposes. As far as possible we use males from hens whose eggs hatched well, and whose chickens lived and grew well. This entails some work, but I believe it pays.

There was an exceptional demand for eggs for hatching last spring. Most of the eggs gave fair to good hatches, but there are always some complaints. Eggs shipped from the same individual birds will give different results and I believe some eggs at least, are injured in transit, if it were not so I cannot in any way account for the poor hatches: for instance, in shipping two settings of eggs from the same pen within two days of each other, the one party got nearly one hundred per cent. to hatch, while the other party got less than ten per cent. Try as best we can there are always some complaints of poor hatches.

When incubators are used for hatching, I would strongly recommend that the machines be disinfected, and furthermore only clean, new laid eggs be set. Operators should be careful to have clean hands when turning or in any way handling the eggs.

The method of rearing practiced here has been given in many reports, and in bulletin No. 189.

We try each year to arrange the colony-houses so that the chickens have a large range, if possible over ground upon which chickens were not reared the previous year. Where chickens are reared on the same ground year after year, the ground is cultivated, and as much of the manure as can be gathered is carried off to other fields.

We reared 583 chickens in colony houses in one of the farm lanes. These birds not only ranged over the lane, but could if they so desired, range over at least one hundred acres of field crops. They damaged the crops slightly in a few places. Several farmers estimated the damage done, some placing it as low as $5.00, and others at $25.00; personally I believe the latter figure about correct. The chickens were put out in April and May, and a few in July, and they were hopper fed, and had buttermilk to drink. They consumed a total of 9,042 lbs. of grain, and 14,000 lbs. of milk. The grain was composed of 2,400 lbs. of chick feed, and the balance corn, wheat and oats. A few of the chickens were sold as broilers during July, but the majority were either put in the breeding pens or fattening crates in September. The total weight of the 583 chickens was 2,739 pounds, this is practically 4.7 pounds per bird. These chickens consumed 3.3 pounds of grain to produce one pound of growth.

Fattening Surplus Stock.

There has been a good demand for well fed chickens this season. The dealers find no difficulty in disposing of large quantities of well fleshed chickens, but the poor or thin chickens, or those off the range have found a very poor market. Last year's experience taught the dealers that this class of stock is very hard to dispose of at a profit, and many dealers I am told lost considerable money on the thin chickens they handled, consequently this season they are buying ordinary stock at low prices. The difference paid by some dealers between stock as it runs and properly fed birds has been from five to seven cents per pound.

In many previous reports mention has been made of the fact that nearly every person with reasonable care and judgment would find it profitable to feed the surplus stock before placing it on the market.

Each year every senior student in the Agricultural and Horticultural options is required to fatten some chickens. This gives them practice in actually doing the work, and the department has the opportunity of observing the results from many feeders. The class this year fed 148 cockerels, of which 108 were Rhode Island Reds, Wyandottes, Plymouth Rocks, Orpingtons, and Light Sussex, and the remaining 40 were Leghorns, Minorcas, and Anconas. The original weight of the 148 birds was 512 lbs., or an average weight of 3.4 lbs. The birds were fed for a period of two weeks, and gained 87.5 lbs., consuming in that time 419 lbs. of grain. Comparing the grains in weight made by the general purpose breeds, with those made by the light breeds, we find that the former produced a pound of gain for 4 pounds of grain consumed whereas with the light breeds it took 17.2 lbs. of grain to make one pound of gain. It is obvious from such results that it would not ordinarily pay to fatten such breeds as Leghorns; and where one is breeding the lighter breeds it would be more economical to dispose of the surplus cockerels as broilers. At a weight of from one and one half to two pounds the light breeds make very good gains. The heavy breeds paid well for the food consumed.

The ration used for fattening these chickens was composed of equal parts by weight of corn chop, low grade flour and middlings. This was mixed with sour milk or buttermilk to the consistency of a pan cake batter. After the birds are put in the fattening crates they are starved for twenty-four hours, so that when feeding commences their appetites are very keen, at first they are fed sparingly, but after a few days the ration is gradually increased until they are given all they will eat up quickly in ten minutes. Two feeds are given daily, and as near equal hours apart as possible. Grit should be given once a week. At the end of the fattening period the birds should be starved from eighteen to twenty-four hours before killing, so as to make sure that the crop and intestines are empty.

Respectfully submitted,

W. R. GRAHAM.

PART XIII.

REPORT OF THE PROFESSOR OF BACTERIOLOGY.

To the President of the Ontario Agricultural College:

SIR.—I have the honor to submit the following report upon the work of the Department of Bacteriology during the year ending November 30th, 1911.

From the nature of the science of Bacteriology, which in its different aspects is closely associated with every phase of farm and home life, the work of the department in that science is very diversified. This work may conveniently be considered under three heads: Instruction, extension work, and research.

INSTRUCTION.

Lectures, demonstrations, and laboratory work in Bacteriology were given to the regular course students of the College and Macdonald Institute, to the short course students in Dairying and Poultry Husbandry, to the Dairy Instructors, to the Normal School Students, and to the Summer Course students, as outlined in the respective curricula of these various courses.

Three of the class of 1911 elected to take the work of the Bacteriology option, and two of them worked their theses in this department.

EXTENSION WORK.

PUBLICATIONS. A text-book on Microbiology for students of Agriculture and Domestic Science was issued from the press during September. The book is by various authors and edited by Dr. Charles E. Marshall, of the Michigan Agricultural College. To this text I had the honor of contributing a chapter on "Heat and the Preservation of Food," and a section on "Inoculation of Seeds of Legumes."

I prepared a monograph on Tuberculosis in Fowls, for the meeting of the International Association of Poultry Instructors and Investigators, held at Orono, Maine, in August.

Mr. Jones contributed an article to Phytopathology, the American journal of plant diseases, on *Scolytus Rugulosus* as an Agent in the Spread of Bacterial Blight in Pear Trees.

A few articles were contributed gratis to the agricultural press of the Province.

EXHIBITS. Besides contributing to the general College exhibit at the Canadian National Exhibition, special material showing the effect of microbial contamination of milk was prepared for the agricultural special train run through the southern part of the Province last spring, and Mr. Jones attended on part of the trip.

A number of cheese were shown at the meeting of the Western Ontario Dairymen's Association, demonstrating the effect of yeasts in causing bad flavors.

Material demonstrating diseases of fowls, and the use of bacterial cultures for inoculating seed was prepared for some of the district representatives of the Department of Agriculture.

Scientific Meetings Attended. I attended the annual meeting of the Society of American Bacteriologists at Cornell University last December, and presented a paper before the society. I attended the meeting of the Western Ontario Dairymen's Association and presented an illustrated talk on "Bacterial and other Contaminations in Milk." A paper on "The Use of Bacteria for Inoculating Seed" was prepared for the 1911 meeting of the Experimental Union.

Routine Laboratory Examination. Under this subject I would include the examination of specimens of diseased animals and plants, water and milk analyses, spoiled foods, etc., etc., sent us by farmers and others. This material has been abundant, and the results are of direct value to those intimately concerned with the various materials.

Progress in Seed Inoculation. The work incident to the preparation and distribution to farmers of cultures of the nitrogen-accumulating bacteria for inoculation of seed increased greatly in volume. Nearly five thousand cultures were sent out, mostly for alfalfa and red clover. Very gratifying reports of increased crops come from a good many farmers using these cultures, and we feel that the value of the legume crops in the Province is very greatly increased from the use of the cultures. In the accompanying table is given a summary of this work as carried on by the department since its inception in 1905.

Summary of Results in Seed Inoculation, 1905-1911.

Year.	Total cultures sent.	Total reports received.	Inoculation beneficial.	Inoculation not beneficial.	*Others.	Per cent. favorable.
1905	246	134	91	40	3	67.9
1906	375	144	72	48	24	60.0
1907	372	187	67	57	63	54.0
1908	2,113	699	397	237	65	62.5
1909	2,017	494	211	161	122	56.7
1910	3,375	771	344	179	248	65.7
1911	4,941	1,223	418	359	446	53.6

* In this column are included reports from farmers who sowed no inoculated seed, or in which long continued drouth, excessive moisture, or some other condition injured or destroyed the seeding.

Research.

Further data have been secured on tuberculosis in fowls and there is now in press a bulletin dealing with this disease.

Some further work has been done on the problem of the role of yeasts in the production of fruity flavors in cheese.

Some observations have been made in co-operation with the department of animal husbandry on tuberculosis in cattle.

Mr. Jones is pursuing studies of the azotobacter group of nitrogen-accumulating organisms.

In conclusion, I wish to express my appreciation of the loyalty and co-operation accorded by the other members of the department staff in carrying on the various phases of the departmental work.

Respectfully submitted,

S. F. EDWARDS.

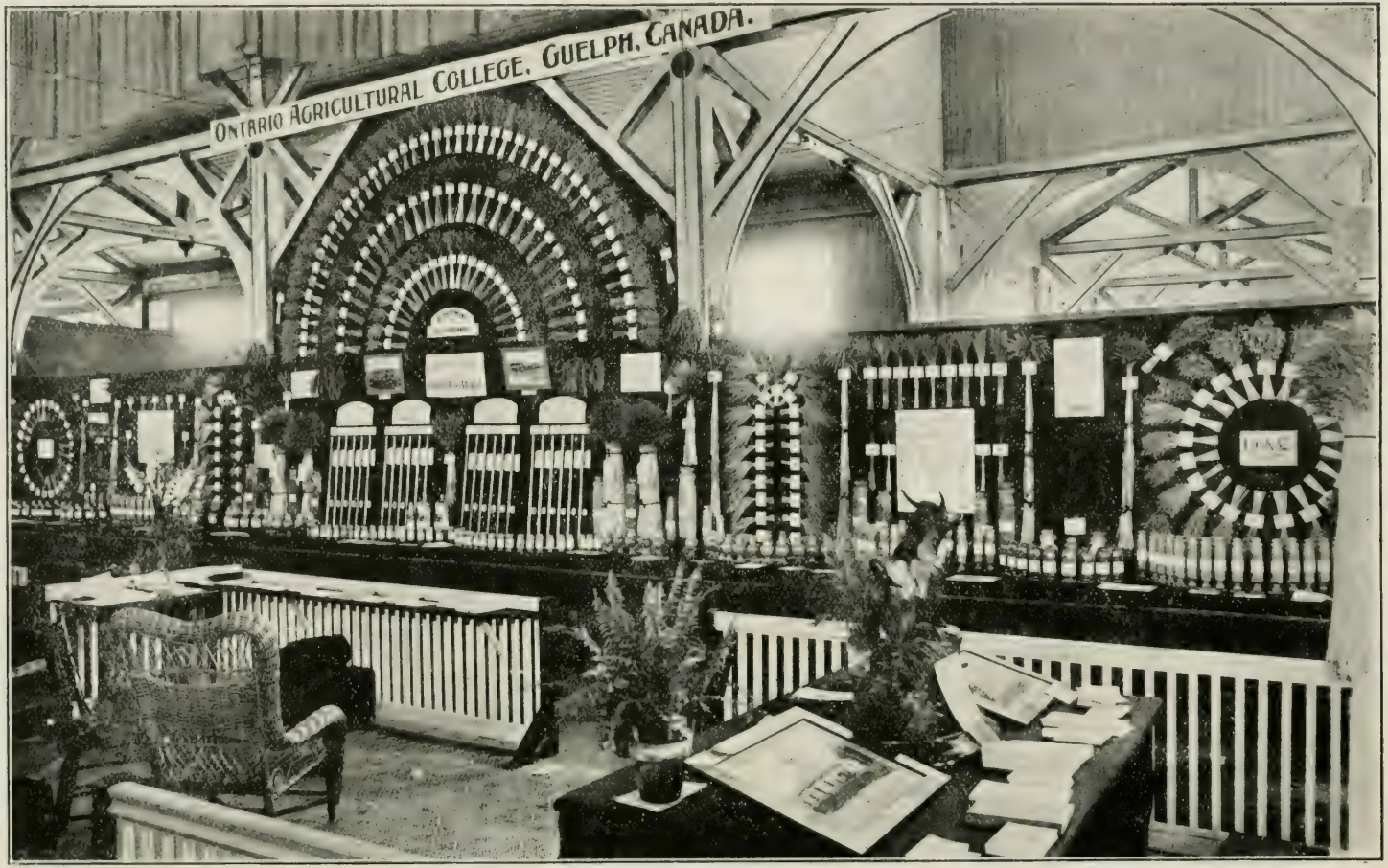


Exhibit made by the Department of Field Husbandry of the Ontario Agricultural College, as shown at the Canadian National Exhibition.

PART XIV.

THE PROFESSOR OF FIELD HUSBANDRY AND DIRECTOR OF FIELD EXPERIMENTS.

To the President of the Ontario Agricultural College:

SIR,—It is my pleasure at this time to submit to you the report of the work done in the Department of Field Husbandry for the year 1911. During the past year the work of the department has gone along smoothly and successfully from both an educational and an experimental standpoint. The students in connection with the College courses have been rather more numerous than in past years, and they have shown a deep interest in both the inside and the outside work. The experiments in Field Husbandry at the College have been conducted along many important lines, and the co-operative work throughout the Province has been conducted with enthusiasm by the thousands of farmers who are in this way doing so much for themselves and for the country as a whole. It is probably safe to say that from 16,000 to 18,000 farmers visited the experimental grounds during the past summer. These farmers were personally conducted through the experimental grounds and the work was explained, and some of the most important results were emphasized. There has again been a large demand to assist various organizations in Ontario in the conducting of short courses, in the delivering of lectures, in the judging at fall fairs, seed fairs and larger exhibitions. We are still unable, however, to comply with nearly all of these requests, owing to the comparatively small number on our staff and the increasing demands of the Province.

A CONCISE OUTLINE OF THE WORK OF THE PAST YEAR.

It is probably true that the great majority of the farmers of Ontario do not realize the extent of the work of the Department of Field Husbandry at the College. It seems necessary to here present a concise outline of the work which has been covered during the year 1911.

The College work, from an educational standpoint, is increasing from year to year. It includes the delivering of lectures and the giving of demonstrations before classes at the College as outlined in the College circular; the delivering of lectures before students in the short course in seed and stock judging, students taking the three months' dairy course, students from the Ontario normal schools, the public school teachers attending the summer courses in July, etc.

As in former years, the experimental work in field Husbandry at the College was conducted on about 2,000 carefully measured plots, located in a section of about fifty acres which was used particularly for that purpose. One of the important branches of that work which has developed during recent years is what is generally known as plant breeding, or the work of improving the leading varieties of cereal crops by means of systematic selection and by cross-fertilization. There were probably 130,000 hybrid plants grown separately in the experimental grounds in 1911.

Besides the thousands of farmers who visit the College annually and who are taken through the experimental grounds, there are various organizations which visit the institution and which receive information regarding the objects and

methods of the work. The experimental plots at the College form object lessons for the students of the freshmen, the sophomore, and the senior years who are taken systematically to the grounds in the regular lecture periods.

The co-operative experiments in Field Husbandry in connection with the Ontario Agricultural and Experimental Union again received close attention in this department, which has direct charge of the growing, the preparation, and the distribution, of seed; and the direction and supervision of the experiments in agriculture on the thousands of farms throughout Ontario. The number of co-operative experiments in 1911 was slightly larger than that in 1910.

At your request, the Department of Field Husbandry arranged the College exhibit at the Canadian National Exhibition, Toronto. In this exhibit, not only was the Department of Field Husbandry represented, but the departments of Botany, Entomology, Horticulture, Agriculture Physics, Poultry, Apiculture, Chemistry, Bacteriology, and Animal Husbandry were also represented by separate exhibits. These, however, were arranged in such a way as to make one complete whole as a College exhibit. This exhibit was centrally located in the Educational building and received much attention during the two weeks of the Exhibition. College officers were in attendance and an opportunity was thus afforded of giving a large amount of practical information to the farmers of Ontario.

Exhibit of the Ontario Agricultural College at the Educational Building at the Canadian National Exhibition at Toronto, 1911.

The correspondence in the Department of Field Husbandry is increasing from year to year and has become very large. In the spring and in the autumn the department frequently receives from one hundred to two hundred or more letters per day. While this correspondence takes much thought and a considerable amount of time, we are pleased to know that the farmers of Ontario are taking so much interest in the work which we are carrying on and have confidence in the work of the department, as is manifested by the way in which they appeal to us for information to assist them in the various problems with which they come in contact in their every day work on the farm.

The preparation of the results of the College experiments for publication in the Annual Report of the College, the examination and the preparation of the results of the co-operative experiments throughout Ontario for the Annual Report of the Ontario Agricultural and Experimental Union, the various newspaper articles emphasizing the important results of experiments conducted both at the

College and throughout Ontario cause a large amount of office work, which has to be done with great care and accuracy. It is gratifying to know, however, that through these means the results of investigations are brought to the homes of a very large number of our farmers.

No changes have been made in the staff of the Department of Field Husbandry in 1911. During the past year, I have been very ably assisted both in the work of the College and in the extension work of the department throughout Ontario by the efficient staff of the department. Mr. W. J. Squirrell, B.S.A., who has been in the department for several years, now takes the greater part of the lecturing in connection with the regular College course. During the past year he gave a lecture at the Annual Seed Fair at Markham and at the Annual Farmers' Institute meeting at Scotland. He also accompanied the Demonstration Train on the Michigan Central Railway between St. Thomas and Niagara-on-the-Lake, assisting in the lectures and in the demonstration work. Mr. C. R. Klinck, B.S.A., the Assistant in Plant Breeding, has direct charge of that department of experimental work. Within the last year, Mr. Klinck acted as judge of grains and read a paper at the Eastern Winter Fair at Ottawa. He also assisted in short judging courses at Peterboro and at Lindsay. Besides these, Mr. Klinck addressed the annual meeting of Farmers' Institute for South Brant, and judged the grain at the Guelph Seed Fair in August last. Mr. A. W. Mason, B.S.A., who is Assistant in the Department of Field Husbandry, has done good work in the office in connection with the experimental work at Guelph and the co-operative work throughout Ontario. Mr. Mason addressed annual meetings of Farmers' Institutes at Owen Sound and at Hawkesville, and judged the grain and roots at the fall fair at Simcoe. Mr. A. E. Whiteside, who has been foreman of the department for many years, has had charge of the men and the students when at work in connection with the various experiments, and has given excellent assistance in planning the experiments and in making careful records of the same. In connection with the office work, Miss J. I. Coxon and Miss E. I. Holmwood have shown interest in the work throughout, and have ably assisted, not only in the stenographic work, but in the preparation of the results for publication as well.

During the past year I have delivered lectures at agricultural conventions, at short judging courses, and at annual meetings of Farmers' Institutes in a number of localities throughout Ontario. I have also acted as judge of grains at the National Exhibition, Toronto, at the Provincial Winter Fair, Guelph, and at a few other places in the Province. I arranged a College exhibit at the Industrial Fair, Toronto, assisted in the Demonstration Train on the Michigan Central Railway in Southern Ontario; examined and reported on farms to be purchased by the Government in connection with Provincial institutions; made an investigation of alfalfa seed production in the Niagara Peninsula, etc. Within the year I attended and addressed the following meetings at Columbus, Ohio: the Annual Convention of the American Breeders' Association, the Annual Convention of the Association of American Agricultural Colleges and Experiment Stations, the Ohio Corn Breeders' Association, and the American Society of Agronomy.

Experimental Work in Field Husbandry.

It seems both wise and necessary to make certain statements in reference to the experimental work at the beginning of the report, in order that the results may be read with intelligence and that much repetition might be avoided.

About fifty acres of land, divided into upwards of 2,000 plots, are used for

experiments conducted with varieties of grain, root, tuber, grass, clover, fodder, silage and other crops; with artificial, green and barn-yard manures; with methods of cultivation, selection of seed, dates of seeding, etc. All of these experiments are conducted with the greatest care, and for several years in succession in order to secure strictly accurate results. These experiments deal with the crops grown on over nine-tenths of the cultivated land in Ontario.

The grounds have a gentle slope towards the south-west, and the soil is an average clay loam. About one-quarter of the land is manured each year with twenty tons of farmyard manure per acre; thus most of the land receives an application of farmyard manure once every four years. No commercial fertilizers are used except in distinct fertilizer experiments, and these occupy only a small number of plots each year. Within the past twelve years, one green crop has been plowed under on each section of the field. The plots vary in size according to the requirements of the different experiments, and the yields per acre are determined from the actual yield of the plots in every instance.

A partial view of the Experimental grounds.

The work in the Experimental Department consists in planning the various experiments; laying out, seeding, and looking after the field plots; harvesting, threshing, weighing and testing the grain; taking up, weighing, counting, testing and storing the potatoes and roots; cutting, weighing and harvesting the grass, corn and fodder crops, etc., and also in picking by hand the samples of grain grown on the plots, some to be sown on the plots the following year and some to be distributed for co-operative experimental work throughout Ontario. A great deal of thought and care is required in planting, supervising and examining these plots, and in studying, comparing and summarizing the results for presentation in reports, bulletins, newspaper articles, and lectures.

Results of Experiments.

All of our field experiments are conducted for at least five years before conclusions are drawn, and many of them are continued for a much longer period of time. For the results of some of the tests which were carried on for five or more years previous to 1911, the reader is referred to former reports. The results of some of the experiments which have as yet been conducted for only one or two

years, are held over until the tests can be carried through for at least another summer. As different seasons vary so much in temperature, rainfall, etc., the average results of experiments continued for several years are of much greater value than those secured from only one or two years' work. Owing to the great care exercised in the work, and the number of years through which the experiments are continued, we are able to present the results with much confidence in their reliability and in their practical value. From year to year the reports of the experimental work are being more widely read and more carefully studied by the farmers of the Province, and this is leading to a greater interest in crop production and a deeper knowledge of plant life on the farms of our country.

Weather Conditions in 1911.

At the Agricultural College, Guelph, the autumn of 1910 was comparatively moist, the winter was early and fairly steady, but the snowfall was somewhat lighter than usual. The month of March of the present year was fine, the early part of April was cold and disagreeable, but the latter part of the month was favorable for seeding. May was pleasant, June was unusually dry, and July was comparatively dry and exceedingly hot. The hot weather in July was quite general throughout the Province. As it is important, for a proper understanding of results of experiments with farm crops, to know the weather conditions in the locality where the experiments have been conducted, the amount of rainfall in each of the summer months in each of the past twelve years is here presented. The amount of rainfall has been carefully determined in each of these years by the Department of Physics at the College, from which department we have received the information. The following table gives the total amount of precipitation in each of the months of April, May, June, July, August and September in each of the years from 1900 to 1911, inclusive:

Inches of Precipitation During the Six Growing Months.

Month.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	Average twelve years.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
April.....	1.69	2.24	2.43	2.69	2.10	1.82	1.44	1.66	1.33	3.60	3.13	1.67	2.15
May.....	1.03	3.26	1.67	2.44	3.01	3.89	2.71	2.64	3.47	3.43	2.75	1.64	2.66
June	4.47	1.53	3.06	3.05	2.86	3.24	4.06	1.11	3.21	1.33	.78	.89	2.47
July.....	3.05	4.07	6.43	2.67	4.99	4.60	4.65	1.92	3.25	4.54	1.89	1.95	3.67
August,.....	.87	3.51	2.18	3.47	3.88	1.98	2.13	.62	2.75	.89	3.18	2.53	2.33
September....	1.52	2.45	3.58	1.48	2.80	2.85	2.49	2.87	.73	.86	3.29	3.42	2.36
Total,....	12.63	17.06	19.35	15.80	19.64	18.38	17.48	10.82	14.74	14.65	15.02	12.10	15.64

The total amount of rainfall at the College for the six months, from April to September, in the average of the past twelve years was 15.6 inches. In 1911 the amount of rainfall during the six months was practically 3½ inches below the

average of the twelve years. In 1911 the amount of rainfall was less than in any one of the eleven years previous with the exception of 1907, in which year it was 1⅓ inches less than that of the present season. Owing to the excessive heat, however, in the month of July, which was an unusually dry month, following the second dryest month in twelve years, the crops suffered considerably. The weather conditions here described have a pretty direct bearing on the results of the experiments for the present year. It has, however, given an opportunity to study results of the various experiments under adverse conditions. The results of experiments for 1911, therefore, have a peculiar value of their own and are worthy of careful thought and study.

Crop Production of a Few Countries as Indicated by the Yields of Wheat.

In comparing the productivity of the soil of different countries, the wheat crop is probably used more than any other. As this is a staple crop in so many of the different countries, the results can generally be used to advantage in comparison. It is interesting to observe the marked difference in yield per acre obtained from the land in different parts of the world. In order to bring out this point a little more clearly, I here present the average yield of wheat per acre as given for each of five countries in each of the past three years:

Average Yields of Wheat Per Acre.

Country.	1909.	1910.	1911.	Average 3 years.
Denmark	37.4	43.7	44.8	**42.0**
Great Britain and Ireland	33.7	30.5	32.6	**32.3**
France	22.0	15.6	20.5	**19.4**
Canada	21.5	16.2	19.5	**19.1**
United States	15.8	14.1	12.6	**14.2**

It will be seen from the results here presented that the little country of Denmark has given an average yield of wheat per acre more than double that of France, Canada, or the United States. It is interesting when we consider that Denmark has been producing crops for so many generations, and that Canada and the United States are both comparatively new countries. Although the tendency in certain parts of both the United States and Canada has been towards a gradual decrease in the production of the soil, yet we find in a country which is so much older a very high yield of wheat per acre. It indicates what can be brought about by intensive methods of cultivation. Denmark gives us an example of what can be done by improved methods of agriculture. As the natural fertility of the soil gradually becomes less in a newer country, the people are compelled to study more carefully the very best methods for maintaining and increasing the soil fertility. In the Province of Ontario there was a gradual decrease in the yield per acre of the leading varieties of farm crops previous to the past period of ten to fifteen years. If we compare the average yield per acre of wheat, oats, and barley, we find that there has been an increase of about 18 per cent. in yield of grain per acre for the past twelve or thirteen years in comparison with a previous period of the same length of time. This increase in yield per acre is probably due, to a large extent, to the development of the live-stock industry, to the more general use of clover and alfalfa on the land, to the introduction of more productive varieties of farm crops,

and to better methods of farming. When we realize that there has been an actual increase of about one-sixth in yield of grain per acre for the whole Province of Ontario, and when we also realize that there are still a great many farmers who have made but few improvements, it suggests to us the fact that some of the farmers of Ontario must be increasing their crop production to a much greater extent than is indicated in the averages here presented. We hope that the results presented in this report will have a tendency to stimulate the indifferent farmers to greater activity and to assist the better farmers in reaching even a higher state of perfection. By so doing, not only would the conditions of the individual farmers be improved, but the prosperity of the whole Province would be greatly increased. Not only would this prosperity be felt throughout the rural districts, but it would probably be felt in the towns and cities to fully as great an extent as the relationship between the prosperity of the country and the prosperity of the city is more closely associated than many people realize.

The Comparative Yields of Different Classes of Farm Crops.

For eleven years in succession, leading varieties of different classes of farm crops have been compared in duplicate experiments with the object of securing the comparative yields of the different classes of farm crops rather than of the varieties themselves. This has been a distinct line of experimental work, and great care has been exercised each year to have the plots uniform in shape, size, and soil conditions. A good deal had been done at this Institution in former years in testing different varieties of the same class of farm crops, but practically nothing was done in making a careful determination of the yields of some of the different classes of farm crops previous to the starting of the experiment here referred to.

The following table gives the average yields of both straw and grain per acre of each of seven classes of farm crops for the eleven-year period:

Class of Crop.	Average yield per acre for 11 years.	
	Straw (tons).	Grain (lbs.)
Barley	1.81	2,672
Emmer	2.02	2,626
Oats	2.38	2,543
Hulless barley	1.75	2,424
Spring wheat	2.21	1,938
Field peas	1.51	1,778
Spring rye	2.07	1,709

The table here presented shows that barley stands at the top of the list in yield of grain per acre. The average yield for the eleven years of the barley over the oats has been 129 pounds per acre. In considering the fact that in the average of twenty-two separate tests made in the period of eleven years, in which the barley gave an average yield per acre of 129 pounds per annum over that of the oats, it should also be remembered that the average percentage of hull in oats is about 30 and that of barley is about 15. Not only have these results been obtained in the experiments at the College, but a careful study of the reports of the Bureau of Industries for Ontario for the past twenty-nine years shows very similar results.

In yield of threshed grain per acre, the barley has surpassed the oats by fully 120 pounds per acre, when we take into consideration the statistical reports of the Province for twenty-nine years, as revealed by the publications of the Bureau of Industries. Not only has the barley surpassed the oats in number of pounds of grain per acre, but the barley has also surpassed the oats in the amount of digestible protein and in the amount of digestible carbohydrates, according to the latest and the best information which is obtainable. According to the reports here referred to, the principal grain crops of Ontario have produced average yields of threshed grain per acre in the following order, starting with the highest and finishing with the lowest yield: barley, winter wheat, oats, field peas, buckwhat, spring wheat, and rye, the average difference between the first and the last being fully 400 pounds of grain per acre per annum. These various results tend to show the value of barley as a large producer of grain in Ontario.

A view of a few of the Alfalfa and the grain plots.

Continuous Growth from Seventeen to Twenty-three Years of Each of Thirty-five Varieties of Farm Crops.

The frequent change of seed of farm crops from one soil to another, or from one locality to another locality, was formerly considered to be almost essential in many localities. Some farmers still think it is wise to change seed frequently. A large number of leading farmers, however, are realizing the fact that in very many cases they are able to grow the same varieties for long periods of time without any change of seed, providing proper care is taken in growing varieties suitable for the soil, in the careful selection of the seed, and in the cultivation of the land. As a number of varieties of oats, six-rowed barley, two-rowed barley, hulless barley, winter wheat, common spring wheat, durum spring wheat, and potatoes have been grown in our experimental grounds from seventeen to twenty-three years without a change of seed from outside sources, the results should be both interesting and instructive. In the table here presented, the average yield per acre of each of thirty-five varieties is given for the whole period of time during which it has been grown.

Yields of Varieties of Cereals and Potatoes grown continuously on the same farm.

Crop.	Variety.	Length of period (years.)	Average bushels per acre.
Oats	Siberian	23	85.3
	Joanette	23	85.3
	Oderbrucker	23	83.1
	Waterloo	23	82.5
	Probsteier	23	82.3
	Bavarian	23	79.7
	Egyptian	23	73.6
	Black Tartarian	23	68.0
Six-rowed barley	Mandscheuri	22	71.8
	Oderbrucker	22	64.8
	Common six-rowed	22	62.5
	Mensury	22	60.6
Two-rowed barley	French Chevalier	22	57.6
Hulless barley	Black Hulless	22	43.8
	Hungarian	22	42.3
Winter Wheat	Dawson's Golden Chaff	17	53.1
	Early Red Clawson	17	48.2
	Bulgarian	17	43.5
	Treadwell	17	42.7
Common Spring Wheat	Saxonka	22	31.1
	Red Fife	22	30.7
	Pringle's Champion	22	30.3
	Red Fern	22	30.3
	Herison Bearded	22	30.1
	White Russian	22	30.0
	Colorado	22	27.5
Durum Spring Wheat	Wild Goose	19	37.5
	Medeah	19	33.8
	Sorentina	19	32.6
Potatoes	Empire State	22	223.2
	Rose's New Invincible	22	210.0
	The Daisy	22	207.8
	Rural New Yorker No. 2	22	206.6
	White Elephant	22	202.4
	Stray Beauty	22	161.8

Fully eighty per cent. of the varieties here presented have given considerably larger yields per acre during the latter as compared with the earlier part of the period. In no case was the yield per acre much less in the latter part of the period than it was in the earlier stages of the experiment. If we take the average of all the varieties included in this test, we find that the yield, instead of decreasing, has increased to a marked degree as the years have advanced. The soil on which these varieties have been grown has changed but little in fertility, and no plant selection has been used in this particular test. It, therefore, seems quite possible to grow the same varieties for a considerable length of time without change of seed, providing care is taken in the selection of the seed and in the growing of the crop.

Suitable Crop Rotations.

It is exceedingly important that farmers generally adopt those rotations of crops for their own farms, which will give the very best results in meeting their special conditions. It would be not only unwise but very foolish to attempt to suggest any one rotation which would apply under all circumstances. The method of farming which a farmer wishes to carry on, determines largely the rotation which would be most suitable to his conditions. There are, however, a few principles which should apply to practically all rotations. Where practicable, every rotation should contain a nurse crop with which to sow the smaller seeds, a cultivated crop to assist in the liberation of plant food and in the eradication of weeds, and a leguminous crop to obtain nitrogen from the atmosphere and to secure valuable fertilizing elements from the subsoil. In fact, it should be the aim to make every crop in the rotation help in the preparation for the crop which is to follow. For our general experimental work, we have adopted for some years a four years' rotation, consisting of grain crops, cultivated crops, grain crops, and pasture crops. As the land is divided into four sections, the four years' rotation fits in nicely and meets the needs of the department. The manure is applied before the cultivated crops in the rotation: hence, the land is manured once in four years, and during that period of time three crops are removed from the land.

The rotation of crops used on the farm proper also consists of four years, but is made slightly different so that it will better meet the needs of the stock requirements of the farm. The rotation referred to consists of one year cultivated crops, one year grain crops, and two years of hay and pasture. It will be seen in comparing these two rotations that they are quite similar with the exception that in the Experimental Department there are two years of grain and one year of pasture, while in the farm proper there is one year of grain and two years of hay and pasture. It is probable that the rotation in the Experimental Department is slightly more severe on the land than that on the farm proper.

In the experiments which have been conducted at the College in which winter wheat, barley, and corn have been grown on clover sod in comparison with the same crops grown on timothy sod, it has been found that the average increase in yield per acre from the former as compared with the latter amounted to 44.7 per cent.

Attention Should be Given to the Best Varieties.

It is perfectly true that many farmers have given a good deal of attention to the choice of varieties of farm crops which they wish to use on their own farms. It is also true that a great many farmers are very indifferent in regard to this important phase of their farm work. It is not an uncommon thing to find men who have been growing the same grain for a considerable number of years without even knowing the varieties which they are using and without giving much thought as to whether there were likely other varieties which could be secured which would probably give much better returns. It is known with a certainty, however, that great improvements have been made along these lines in recent years. Through the influence of experiment stations and the various agencies which are at work in the Province of Ontario, much greater care has been exercised in recent years than formerly in securing those varieties of farm crops which are the best which can be obtained at the present time. It is exceedingly important that every farmer should endeavor to secure the very best kinds of farm

crops he can obtain for his own particular farm. After he has secured the most suitable varieties which can be obtained, he can usually grow these varieties for a considerable length of time, providing he takes the proper care of the seed which he uses. The variations in varieties in any one class of farm crops are usually quite marked. These variations are frequently greater and more significant than many people realize. After growing, and testing, and studying nearly twenty-five hundred varieties of farm crops within the past quarter of a century, nearly all of which have been grown for at least five years in succession, I am thoroughly convinced that it is very important to select the very best varieties, both for the immediate results and as a basis of plant improvement. Variety, in the true sense of the word, expresses heredity and implies pedigree. The pedigree may indicate that great care and considerable knowledge have been employed in the development of the crop, or it may mean but very little indeed. If every new and well established kind of crop could be confined to one distinct name, the term variety would have a deeper meaning than it sometimes has at the present time. It is unfortunate that old varieties occasionally receive new names simply for the purpose of giving them false values and of enabling those who are selling seeds to obtain greater prices thereby. It must not be overlooked, however, that there are many true varieties of practically all classes of farm crops, which are very distinct and have characteristics which differ materially and which are fairly constant. The farmer, while unable to make careful tests of a large number of varieties, should lose no opportunity in securing the best information possible from the agricultural colleges and experiment stations, and test for himself those varieties which have given the most satisfactory results in his own country. By simple experiments upon his own farm he can learn which varieties are the best suited to his own conditions and can then grow those varieties with a great deal of satisfaction.

Influence of Seed Selection.

A large amount of careful work has been done at the Ontario Agricultural College to determine the influence of different selections of seed upon the resulting crop. For this experiment, fresh seed had been taken each year from the general crop of grain grown either on the Farm proper or in the Experimental Department. It will, therefore, be understood that whatever difference there is from the influence of the selection of seed, that difference is attributed entirely to the careful selection of the seed for the separate years in which the tests were made. For the large, plump seed, none but well developed grains were selected; for the small, plump sample, the grains selected were of a uniform character; and for the shrunken sample, none but shrunken grains were used, the last selection being made regardless of the size of the kernals. The sample of broken grain, in the case of barley, contained nothing but grains which had been broken crosswise; split grain, in the case of winter wheat, contained nothing but grains which were broken lengthwise; and split seed, in the case of peas, contained peas which were split and not broken. The grain from which these selections were made was all threshed with a grain separator, and the splitting and the breaking of the grains were, therefore, done in the usual process of threshing. In the selection of large, plump seed, one-half pound was carefully weighed from each class of grain. The number of large, plump seeds of each kind of grain was then counted, and a corresponding number was taken of the medium sized grain; the small, plump grain and the shrunken grain. In the case of the broken or split grain, twice the num-

ber of the half kernels, as compared with the whole grains, were used. The different selections were carefully sown upon plots of similar size. The average results of each of these selections which were made from six to nine years are presented in tabulated form as follows:

Class of Grain.	Years the tests have been repeated.	Selections.	Weight per measured Bushel. (pounds)	Average yield per acre per annum.	
				Tons of straw.	Bushels of grain by weight.
Spring wheat,..	8	Large plump seed....	59.1	1.4	**21.7**
		Small plump seed....	58.3	1.3	**18.0**
		Shrunken seed ....,..	56.9	1.2	**16.7**
Winter wheat,..	6	Large plump seed....	59.4	2.6	**46.9**
		Small plump seed....	59.2	2.2	**40.4**
		Shrunken seed.....	59.1	2.1	**39.1**
		Split seed	54.2	.6	**9.3**
Oats ,.....	7	Large seed	33.2	1.9	**62.0**
		Medium sized seed...	32.2	1.8	**54.1**
		Small seed	31.8	1.8	**46.6**
Barley ,.....	6	Large plump seed....	49.5	1.5	**53.8**
		Small plump seed....	48.8	1.5	**50.4**
		Shrunken seed.....	49.1	1.4	**46.0**
		Broken seed	48.6	1.3	**43.2**
Peas ,.....	6	Large seed	56.3	1.3	**28.1**
		Small seed	56.3	1,1	**23.0**
	9	Sound seed	58.1	1.4	**29.2**
		Split seed	57.9	.6	**10.2**

The results which are presented are very interesting and important in showing the influence of one year's selection of the seed of the principal farm crops which are grown in Ontario. In every instance, the large, plump seed gave a greater yield of grain per acre than small plump, shrunken or broken seed. From a practical standpoint, it seems to be excellent practice, not only to sow clean seed grain that will be free from weed seeds, but to have the cleaning so thoroughly done that none but the very best seed is secured. When this practice is carried out, an important step has been made towards the obtaining of high yields of grain of superior quality.

It should be clearly understood that in this experiment exactly the same number of seeds were used in the different plots. The experiment, therefore, deals with numbers of seed rather than exact quantities of seed used on given areas of land. The results indicate in a very marked degree, however, that the large plump seeds will produce larger, more vigorous, and more productive plants than seeds of the other selections included in the experiment under discussion.

In the spring of 1909, an experiment was started at the College in which both large and small sized seeds of each of five different varieties of oats were planted at seven different distances apart. The object of this experiment was to endeavor to find out whether the maximum yield which could be obtained from large, plump seed would be different from the maximum yield which could be obtained from small, plump seed. Although this experiment is not yet completed, the results during the three years are interesting and suggestive. The maximum yields from the large, plump seed have been greater than the maximum yields from the small, plump seed in 91.7 per cent. of all the tests which have been made. We expect to present the details of this experiment after we have obtained the results of another year or two.

In another experiment which has been conducted at the College over a series of years, in which heavy and light oats have been grown continuously in competition with each other, the results are exceedingly marked. The heavy oats have surpassed the light oats in appearance of grain, in weight of grain per measured bushel, and in yield of both straw and grain per acre. For fuller details of the last named experiment, the reader is referred to page 181 of the Annual Report of the Ontario Agricultural College for 1908.

Plant Selection as a Factor in Crop Improvement.

Although many varieties of farm crops are fairly constant in their characteristics, yet it will be seen on examination that individual plants will vary more or less. Taking advantage of these variations, systematic experimental work in seed selection has been carried on at a large number of agricultural institutions. Our own College has devoted a considerable amount of attention to the improvement of farm crops by making a careful selection of individual plants and in testing these by what is known as the head-to-row method, although in most of the tests

Selecting plants from the nursery plots in connection with the work in plant improvement.

at Guelph, the term plant-to-row method would probably be more applicable. A great deal could be written on this line of investigation, but suffice it to say that we have recently introduced throughout Ontario a few of our new strains which have originated from our selection work.

The O. A. C. No. 21 Barley was distributed throughout Ontario in connection with the co-operative experiments of the Ontario Agricultural and Experimental Union some five years ago. It is now increasing very rapidly throughout the Province, and it is likely to soon take the place largely of the Mandscheuri barley, which the College imported from Russia and which has been of such great value to the farmers of Ontario. It is probably safe to say that in the Competition of Standing Fields of six-rowed barley in Ontario in 1911, and of the threshed barley at the Canadian National Exhibition, Toronto, and in the two largest sections of the Seed Department of the Winter Fair at Guelph, all the awards, without a single exception, went to the O. A. C. No. 21 variety.

The O. A. C. No. 72 oats, which is also a pure selection, was distributed throughout Ontario in connection with the Ontario Agricultural and Experimental

Union in the spring of the present year. From the reports which have been received, this variety of oats has done exceptionally well in a very severe season, when grown in comparison with some of the leading varieties of the Province. The reports seem to indicate that it has surpassed in yield per acre, the Siberian, the Lincoln, and the Regenerated Abundance, with which it was carefully tested. Just what will be the future development of this variety of oats throughout the Province, time alone will reveal.

Besides the selections already referred to, important strains of hulless barley and spring rye have been recently introduced for testing purposes throughout the Province. A very large number of selections are being carefully studied at the College and are being tested in comparison with the very best of the named varieties.

Cross-fertilization as a Factor in Plant Improvement.

Not only has the College carried on extensive work in both seed and plant selection, but it has also, within the last few years, given a considerable amount of attention to the cross-fertilization of some of the most important varieties. In connection with the work of plant improvement at the College, it might be stated that the Hon. Willet M. Hays, Assistant Secretary of Agriculture for the United States, after visiting our work at Guelph, made a statement that he considered that the work in plant breeding at this Institution was the most extensive and the most complete of any that he had yet seen on the American continent. Although we have published but little along this line, we have been carefully and quietly working away in the study of the principles of plant breeding, and especially with the object of securing new varieties of farm crops which are more suitable for cultivation throughout Ontario than any of the varieties which we have at the present time. This work is so extensive that it is practically impossible to even give a summary of what has been done, at this time. It is believed, however, that some valuable information is being obtained and that some important new varieties of farm crops are being originated. In order to illustrate this point, it might be stated that a new variety of oats has been originated through cross-fertilization, which is of better quality and probably of finer appearance than any one of some three hundred named varieties of oats, which have been imported from various parts of the world, and which have been under test at the College within the past twenty years. This new hybrid oat, however, has not been distributed, as it is desirable that we make some further improvements in regard to the yield and the length of the straw, before handing it over to the farmers for general cultivation. We have in all, many thousand hybrids of our principal grain crops which we are carefully studying, and with which we are experimenting at the College.

Twenty-six Years' Experience in Co-operative Experimental Work.

The distribution of seed for experimental purposes with the object of improving the farm crops of Ontario, has been conducted through the medium of the Ontario Agricultural and Experimental Union. The work of this organization is an outgrowth of the experimental investigations conducted at the Ontario Agricultural College, and the apparent needs of the farming community of the Province. It is an important connecting link between the experimental work of our College and the farmers of the country. The great object of the co-operative experimental work in Ontario is to help the farmer to help himself. Its aim is to encourage the farmers of all classes to do better work for themselves and

for others, than they have been doing in the past. It endeavors to give men a deeper interest in farming, a higher opinion of their occupation, a greater appreciation of their responsibilities, an opportunity of making more money, and the means by which they can take a more prominent part in the progress and the development of their country. Although the co-operative work had a small beginning, and was at first confined to the testing of a few crops and fertilizers, it has increased until it now includes thousands of experimenters. From time to time, new lines of activity have been added, until many branches of agriculture have been included in the system. A great bulk of the co-operative experiments have been conducted by the farmers themselves upon their own farms. The work in Ontario has been purely a volunteer movement from start to finish. No financial help whatever has been offered any one to undertake or carry through the co-operative work. The materials for the experiments, the instructions for making the tests, and the blank forms for reporting the results are furnished free of charge to those who engage in the work. Experimenters in crop production use the soil on their own farms, conduct the experiments themselves, and report the results to the College. In those experiments in which crops are produced, the produce is retained by the experimenters as their personal property, except in some instances in which small quantities are returned to the College for comparison.

The co-operative work in Field Husbandry has been conducted for a longer time than that of any other department. In Field Husbandry alone, there have been 63,302 distinct tests made throughout the Province since the work was started twenty-six years ago. Each of these tests consisted of from two to ten plots. The increase in the number of experimenters in Field Husbandry can be seen from the following figures, which show the average yearly number actually engaged in the work in each of the five five-year periods during the last quarter of a century, and also the number of experimenters in agriculture for 1911.

Five Year Periods.	Average Annual Number of Experimenters.
1886 to 1890 (5 years)	71
1891 to 1895 "	1,060
1896 to 1900 "	2,992
1901 to 1905 "	3,379
1906 to 1910 "	4,278
1911 (1 year)	4,490

In 1911, there were in all thirty-nine separate and distinct lines of co-operative experiments conducted throughout Ontario with field crops. These included spring and fall grains, root crops, forage, fodder, silage and hay crops, culinary crops, the growing of grains, grasses and clovers in different combinations, the application of commercial fertilizers and farmyard manures, etc.

The system of co-operative experiments here described is very different from a system of seed distribution where no definite instructions, nor systematized plans are given, for conducting accurate work and for reporting the actual results. An observant person would probably notice that the former has many commendable features not found in the latter, and that the latter has some objectionable features which are not included in the former.

Although the Experimental Union, through its system of co-operative experi-

ments, has been doing very excellent work in the past, we believe that greater results await it in the future, and that it will continue to exert an increasing influence for the betterment of agriculture in Ontario. For the results of the co-operative experiments for the past year, the reader is referred to the Annual Report of the Ontario Agricultural and Experimental Union for 1911.

The Growing of Grains in Different Combinations for Grain Production.

We have already emphasized the great importance of securing the best varieties of grain to be sown separately in order to obtain high returns. Not only do we consider it very important to secure the best varieties of each class of farm crops, but also to use seed of the most perfect form. While we are firm believers of using large, plump, sound seed, free from impurities, and of the very best varieties, we have been desirous of securing information as to the probabilities of certain definite combinations in producing even higher yields per acre than the definite varieties when grown separately. In order, however, to secure definite and useful information on this question, we have for years been conducting quite elaborate experiments at the College, in which a number of different problems have been considered, which have a direct bearing on the growth of grains in various combinations. The results from these experiments were considered of great value. We believe they have already had a marked influence in grain production in Ontario, as there is at the present time about one-half million acres used annually for the growing of mixed grains for grain production.

The first experiment with mixed grains which was conducted at the College, included oats, barley, spring wheat, and peas. The experiment was conducted in duplicate, in each of five years, and the grains were sown separately and in eleven different combinations, having two, three, or four grains in each mixture. The average results show that the grain which was grown in mixtures produced larger yields per acre than the same kinds of grain grown separately, in from ninety to ninety-five per cent. of the different tests. Of the eleven different mixtures used, the combination of oats and barley gave the highest average yield of threshed grain per acre. The mixture gave fully two hundred pounds of grain per acre more than either oats or barley when grown separately.

There seems to be an impression on the minds of some farmers that the addition of seed of such crops as flax, spring wheat, or hulless barley to a mixture of oats and six-rowed barley, does not lessen the yield of the oats and barley, and that the amount of seed of the flax, spring wheat, or hulless barley is obtained as an entirely extra crop. In order to glean information on this question, an experiment was conducted in duplicate in each of five years with the object of ascertaining whether or not a seed mixture, composed of 1 bushel of oats and 1½ bushels of barley per acre, could be improved by the addition of a small quantity of some other kind of seed. In addition to the mixture of oats and barley here mentioned, four other combinations were made up by adding to this standard mixture one-half bushel of each of the following kinds of crop: Flax, emmer, spring wheat, and hulless barley. The average results of the ten tests made in the five years show that the greatest yield of grain per acre was produced by the use of oats and barley without the addition of any of the other kinds of grain used in this experiment. Whenever flax, emmer, spring wheat, or hulless barley were added to the standard mixture of oats and barley, it decreased the yield per acre, even though a greater amount of seed was used in each case.

Different Proportions of Oats and Barley.

For eleven years in succession, experiments have been conducted in duplicate each year, at the College, by sowing nine different proportions of oats and barley in order to determine which mixture and which quantity of seed would give the best results in the production of grain and straw. One experiment was started and was continued for six years, when it was dropped, and another experiment was started, and has now been conducted for five years in succession. In the first test, the lightest seeding used consisted of one-half bushel of oats and one-half bushel of

Mandscheuri Barley and Daubeney Oats grown in combination.

barley, and the heaviest of one and one-half bushels of oats and one and one-half bushels of barley per acre. The range of seedings, therefore, of the mixtures, ran from one to three bushels of seed per acre. The average results show that the greatest number of pounds of grain per acre was produced from the mixture of one bushel of oats (34 lbs.) and one bushel of barley (48 lbs.), or a total amount of 82 pounds of the mixed seed per acre.

A second experiment was started in the spring of 1907, and has been conducted in duplicate each year since that date. This also consisted in testing nine different proportions of oats and barley. The mixture of four pecks of oats and four pecks of barley, by weight, per acre, was the only mixture which was similar in this and in the previous experiment. The experiment was conducted twice in 1907, once by using the Mandscheuri barley and the Daubeney oats, and once by using the Chevalier barley and the Siberian oats. In 1908, the experiment was repeated as in 1907, except that the two-rowed Canadian barley was used instead of the Chevalier barley in combination with the Siberian oats. In 1909, in 1910, and in 1911, the varieties used were similar to those described for 1908. The following table gives the average of the duplicate results of this experiment for the five years, in tons of straw and in pounds of grain per acre, and also shows the average percentage of each kind of grain in the crops produced:

Mixtures—Quantities of seed sown per acre by weight.	Percentage of Oats and Barley in crop, 5 years.		Average yield per acre, 5 years.	
	Oats.	Barley.	Straw.	Grains.
			Tons.	Lbs.
3 pecks Oats, 3 pecks Barley.....	33	67	1.69	2,587
3 " " 4 " "	27	73	1.72	2,598
3 " " 5 " "	23	77	1.68	2,647
4 " " 3 " "	39	61	1.72	2,612
4 " " 4 " "	34	66	1.72	2,659
4 " " 5 " "	29	71	1.70	2,625
5 " " 3 " "	43	57	1.76	2,645
5 " " 4 " "	41	59	1.67	2,581
5 " " 5 " "	34	66	1.66	2,514

An exceedingly interesting feature of the two experiments, in which nine different proportions of oats and barley were used in combination, is the fact that the same mixture which gave the highest results in the first test of six years, also gave highest results in the other experiment of five years, the mixture being four pecks of oats (34 lbs.) and four pecks of barley (48 lbs.) or a total of 82 pounds of the mixture per acre. It will therefore be seen that the results of experiments conducted at the Ontario Agricultural College in the past eleven years, indicate pretty strongly that, under the average conditions under which these experiments were conducted, a mixture of 34 pounds of oats and 48 pounds of barley, or a total of 82 pounds per acre, is one which is capable of making a very high record, as it has surpassed in yield per acre any one of sixteen other combinations. An interesting point in connection with this experiment is the fact that the largest amount of seed per acre gave the lowest yield of grain. A study of the tabulated results here presented will show the fact that the barley exerts a marked influence in the production of the crop. It will be seen that in the seventh plot, where there were five pecks of 42½ pounds of oats and three pecks or 36 pounds of barley, the average crop produced contained 43 per cent. of oats and 57 per cent. of barley. It will, therefore, be seen that the barley has a greater influence than the oats in determining the crop production of the mixture of these two classes when grown together.

Different Varieties of Farm Crops Grown in Combination.

In each of five years, an experiment has been conducted in which different varieties have been grown in combination in order to find out the most desirable mixtures to use. A medium ripening variety of oats and a medium ripening variety of barley do not, as a rule, mix well together, owing to the fact that barley generally ripens several days earlier than oats. For this purpose, a very early variety of oats should be used with a six-rowed barley, or a very late variety should be used with an ordinary maturing variety of oats. If this precaution is not taken, the varieties will not ripen together and the results are decidedly less satisfactory, even though the yields might, in some cases, be slightly greater. The following table gives the percentage of barley and other grains in the crops produced and also the average results in yield of both straw and grain per acre for five years of the different combinations included in this test:

VARIETIES OF FARM CROPS GROWN IN COMBINATION.

Mixtures—Quantities of seed per acre, by weight.	Percentage of Barley and other grains in crop. (5 years)		Average yield per acre. (5 years)	
	Barley.	Other Grains.	Straw.	Grain.
			(Tons.)	(Lbs.)
Black Hulless Barley, 60lbs., Common Emmer, 40 lbs. .	65.22	34.78	1.26	1,940
Guy Mayle, Hulless Barley, 60 lbs., Siberian Oats, 34 lbs.	52,86	47.14	1.46	2,234
Black Hulless Barley, 60 lbs., Siberian Oats, 34 lbs....	60.05	39.95	1.32	2,123
Two-rowed Canadian Barley, 48 lbs., Banner Oats, 34 lbs.	58.70	41.30	1.49	2,136
,, ,, ,, 48 lbs., Siberian Oats, 34 lbs.	57.28	42.72	1.43	2,159
French Chevalier Barley, 48 lbs., Siberian Oats, 34 lbs..	58.35	41.65	1.65	2,242
Mandscheuri Barley, 48 lbs., Daubeney Oats, 34 lbs.....	74.87	25.13	1.27	2,393
,, ,, ,, Alaska Oats, 34 lbs.....	70.92	29.08	1.37	2,436
,, ,, ,, Siberian Oats, 34 lbs.....	67.78	32.22	1.31	2,217
,, ,, ,, Banner Oats, 34 lbs.....	68.74	31.26	1.43	2,304
,, ,, ,, Joanette Oats, 34 lbs.....	72.50	27.50	1.46	2,317
,, ,, ,, Black Hulless Barley, 60 lbs.....	59.88	40.12	1.27	2,227
Mandscheuri Barley, 48 lbs.. Guy Mayle Hulless Barley 60 lbs	66.70	33.30	1.38	2,264
Mandscheuri Barley, 48 lbs., Dakota Mammoth Rye, 56 lbs.....	61.20	38.80	1.58	1,954
Mandscheuri Barley, 48 lbs., Common Emmer, 40 lbs...	74.03	25.97	1.29	2,214
,, ,, ,, Wild Goose Spring Wheat, 60 lbs.....	74.27	25.73	1.40	2,124
Mandscheuri Barley, 48 lbs., Early Britain Peas, 60 lbs.	91.06	8.94	1.33	2,277
,, ,, ,, Prussian Blue Peas, 60 lbs.	90.12	9.88	1.40	2,109
,, ,, ,, Flax, 56 lbs.....	91.98	8.02	1.30	2,327

As was pointed out in a previous experiment, the influence of barley seems to be decidedly marked in the character of the crop produced from mixtures of barley with other kinds of grain. In the results here presented in tabulated form, it will be seen that in every single instance there was over 50 per cent. of barley in the resultant crop from the different mixtures sown. The lowest percentage of barley was where the French Chevalier two-rowed variety was used with the Siberian oats, and the highest percentage of barley in the resultant crop was where Mandscheuri barley was mixed with the Common flax. The results show that the influence of the Mandscheuri barley is more pronounced than that of any of the two-rowed barleys used in combination with oats. Previous to 1910, the combination of Mandscheuri barley and Daubeney oats gave a greater yield of grain per acre than any other mixture of barley and oats. In the results for 1910 and for 1911 included, however, we find that the Mandscheuri barley and the Alaska oats, when combined in the proportions of one bushel each, heads the list with an average yield of 2,436 pounds of grain per acre, or an average yield of 43 pounds per acre over the mixture of Mandscheuri barley and Daubeney oats, which stands second in productiveness. It will be noticed that the mixture of Mandscheuri barley and Banner oats was surpassed by the mixture of Mandscheuri barley and Daubeney oats by 89 pounds of grain per acre per annum.

PERCENTAGES OF GRAIN PRODUCED BY DIFFERENT MIXTURES.

In each of the past five years, an experiment has been under way in which eight kinds of grain have been used in different combinations. One of the principal objects of this experiment has been to ascertain the relative power of the different kinds of grain in reproducing themselves in the following crop. The mixtures have been made up in two different ways: First, by using equal quantities of seed by weight of all the varieties; and second, by using the same amount of seed of each variety as is usually sown when the grains are grown separately. Each of the mixtures here described was sown at the rate of 112 pounds of seed per acre. Each part of the experiment was conducted in duplicate each year. The following table gives the average results of the two tests for the five years, and shows the percentage of each grain in the crop produced for each of the methods of combination indicated above:

Varieties used in each mixture.	Uniform weights of seed sown. 10 tests.		Quantities of seed in same proportion as when grown separately. 10 tests.		Average of two classes of mixtures 5 years. 20 tests.
	1911	Average 5 years, 1907–11.	1911	Average 5 years, 1907-11.	Average of two averages.
Six-rowed Barley (Mandscheuri).....	30.5	25.9	31.5	24.8	**25.4**
Oats (Banner)	11.8	17.7	8.8	12.1	**14.9**
Spring Rye (Dakota Mammoth).....	20.8	13.7	20.0	13.4	**13.6**
Emmer (Common)	9.5	10.5	10.8	12.1	**11.3**
Spring Wheat (Red Fife)	5.6	10.3	5.8	11.3	**10.8**
Hulless Barley (Guy Mayle).....	18.1	10.5	18.5	11.1	**10.8**
Spring Wheat (Wild Goose).....	3.3	6.7	4.3	8.6	**7.7**
Field Peas (Early Britain).....	·5	4.8	.5	6.8	**5.8**

In studying this table, a person is impressed with the fact that the six-rowed barley has exerted a very marked influence in the character of the crop produced. This quality of the barley is shown in the results of both methods of combination used in this experiment. A study of the table will show wonderful variations in the different kinds of grain in reproducing themselves when sown in combination with other kinds of crops. The macaroni spring wheat, known as the Wild Goose variety, and the field peas have given comparatively poor results in grain production when sown along with other grains. The Common Emmer and the Red Fife spring wheat have nearly but not quite held their own. The spring rye, however, has shown a little greater percentage in the crop produced than it occupied in the seed mixture which was sown.

When studying the results of this experiment, it is well to examine the results of a somewhat similar experiment, which consisted of twelve crops which were grown together in duplicate experiments in each of six years. The average results of the experiment in which twelve different crops were used in combination are presented in tabulated form as follows:

Varieties used in each Mixture.	Percentage of grains in mixtures.	
	Uniform weights of seed sown. 6 years. 12 tests.	Quantities of seed in same proportion as when grown separately. 6 years. 12 tests.
Six-rowed Barley (Mandscheuri)	18.1	17.1
Spring Rye (Common)	13.3	14.1
Hulless Barley (Black)	12.5	14.2
Early White Oats (Alaska)	12.7	9.4
Black Oats (Joanette)	11.9	8.6
Emmer (Common)	7.0	7.9
Hulless Barley (White)	5.8	6.9
Peas (Field)	4.4	7.6
Spring Wheat (Wild Goose)	4.8	6.3
Grass Peas	5.6	4.7
Vetches (Common)	2.3	1.9
Flax (Common)	1.8	1.3

It is interesting to observe how closely these two distinct experiments coincide with each other. In each of these separate tests, the six-rowed barley stands at the top of the list in the percentage of grain in the average crop which has been grown. By taking both of these experiments into consideration, we have strong evidence of the value of six-rowed barley and of oats in reproducing themselves even when sown in combination with a larger number of other leading varieties and classes of farm crops. Field peas, although a valuable grain when mixed with oats for the production of green fodder or of hay, occupy a comparatively low place when grown in a mixture for grain production. This is a very important point, as there seems to be a wrong impression in regard to the use of peas in mixtures for the production of grain. Some farmers have the impression that a few peas added to a mixture increase the yield of grain per acre and improve the quality of the feed. While it is true that the presence of peas is likely to increase the value of the feed pound for pound, it is also true that in many cases it is better to sow the peas by themselves rather than in combination with other grains, when the main object of the experiment is grain production. Grass peas and vetches give even poorer results than field peas when grown in combination. As far as grain production is concerned, the evidence is very strong indeed in favour of a combination of oats and barley, and if any other kind of crop is to be added to this mixture, the spring rye appears to be the one which would likely be the most influential in assisting in the production of grain.

Loose Smut in Oats and Stinking Smut in Wheat.

In the spring of 1911, some varieties of oats were sprinkled with spores of the loose smut, after which they were sown without further treatment on plots located side by side. The Early Ripe variety proved to be practically immune to the attacks of the smut spores, while both the Black Tartarian and the Siberian varieties were quite badly infested with the stinking smut in the crop of the past season. This is a further evidence that there is a marked difference in the different varieties as to their susceptibility to the attacks of smut.

At one time the writer considered that variety exerted, but slight influence with regard to the amount of injury caused by the loose smut in oats or the stink-

ing smut in wheat. From recent observations, however, it seems very evident that some varieties are decidedly more susceptible than other to the attacks of smut. During the years 1902, 1903, 1904 and 1905, we did not treat our varieties of oats for smut, but carefully picked out all smutted heads each year and kept an accurate record of the amounts of smut produced in the different varieties. The difference in the different varieties was very marked. In the spring of 1906, however, the varieties were all carefully treated by immersing the seed for twenty minutes in a solution made from one pint of formalin and forty-two gallons of water. In each of the past five years no treatment of the seed of these varieties has taken place. The following table gives the number of smutted heads taken from a plot 10 links wide by 100 links long from each of six different varieties of oats in each of the past ten years:

Variety.	Number of Smutted Heads per Plot.									
	Before Treatment.				After Treatment.					
	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.
Early Ripe	.....	.....	3	.....	.....	.....	.....	.....	.....	.....
Joanette	20	9	10	18	.....	2	12	1	.....	.....
Siberian	32	43	78	20	.....	1	.....	.....	5	.....
American Banner	116	303	317	22	.....	3	2	4	5	.....
Black Tartarian	332	608	369	62	.....	3	12	15	29	25
Early Champion	634	380	1,244	166	.....	11	9	5	6	12

The tabulated results here presented show in a very marked degree the differences in the varieties in their apparent susceptibility to smut and the effectuality of the treatment in destroying the smut which increases after treatment only slightly from year to year. When the oats are grown on one farm, however, and the threshing machine comes from another farm where the smut is very bad, it is almost sure to bring smut spores with it and thus to contaminate the oats, even though the seed had been treated in the spring previous. In order to keep the varieties of oats comparatively free from smut, therefore, it is necessary to treat occasionally and to watch carefully that smut spores are not introduced in considerable quantities from one farm to another.

While it is true that the amount of smut varies with the different varieties, it will also be noticed that there is a considerable difference in the amount of smut produced in different seasons. Some years the conditions are much more favourable for the development of smut than in other years.

The Early Ripe variety is the earliest oat amongst some two hundred and sixty varieties which we have grown in the experimental grounds, but the grain is long and slender, giving a rather light weight per measured bushel. From our experiments with this variety, it seems evident that it is immune to the attacks of smut. It is true that there were three smut heads found in 1904, but when it is considered that fully 17,000 grains of oats are sown in each plot, it is quite likely that the three smutted heads were all from one plant produced from a seed of

some other variety which, by means of manure or some other way, got into the plot. We have introduced some spores with the seed of the Early Ripe variety before seeding, but have found the variety to be immune to the attacks therefrom. The resistance of some varieties to the attacks of smut shows the importance of further study along this line with the object of securing either through selection or through hybridization important varieties of oats and of wheat which may be practically immune to the attacks of smut.

Smut is a living plant. The spores of this fungus correspond to the seeds of the grain, and when they are sown together they both germinate. The spores produce thread-like tubes or stems which enter the young grain plants and which eventually reproduce the spores in the heads of the plants. It is, therefore, very important to kill all the spores of the smut and prevent further infection. If this is done, one treatment should prove effectual for several years.

For five years in succession, experiments have been conducted at the Ontario Agricultural College for the prevention of the loose smut in oats and of the stinking smut in winter wheat. Careful determinations have been made each year to ascertain the comparative influence of the different treatments. There were in all, seven treatments for oats and five treatments for wheat. In every instance, one sample was left untreated as a basis of comparison. The experiment was conducted in duplicate both with oats and with wheat each year, there being two varieties of each class of grain used for the experiment. The following treatments were used throughout with the exception that numbers 3 and 6 were omitted from the treatments for the stinking smut in wheat:

(1) *Untreated.* One sample of oats and one sample of winter wheat of each variety were left untreated, in order that the influence of the various treatments might be observed.

(2) *Immersion in Hot Water.* For this treatment, the grain was placed in a bag which was then immersed in water at about 115 degrees F. Soon afterwards, it was placed in water which was kept at a temperature of between 130 degrees and 135 degrees F. The grain was occasionally stirred and was allowed to remain in the water for a period of fifteen minutes. It was then spread out on a clean floor to dry, where it was stirred occasionally.

(3) *Immersion in Bluestone Solution for Five Minutes.* For this treatment, a strong solution was made by dissolving one pound of copper sulphate (bluestone) in one gallon of water and then immersing the oats in the solution for a period of five minutes.

(4) *Immersion in Bluestone Solution for Twelve Hours.* In this treatment, the bluestone solution was made by dissolving one pound of bluestone in twenty-five gallons of water, and the oats were immersed in this solution for a period of twelve hours.

(5) *Sprinkling with Bluestone Solution.* The solution was made by dissolving one pound of bluestone in ten gallons of water, which was used for sprinkling over the oats until they were thoroughly moistened after being carefully stirred.

(6) *Immersion in Potassium Sulphide Solution.* The potassium sulphide treatment consisted of soaking the seed for two hours in a solution made by dissolving eight pounds of potassium sulphide in fifty gallons of water.

(7) *Immersion in Diluted Formalin.* The solution of formalin (formaldehyde) used for the immersion process was made by pouring one-half pint of the formalin into twenty-one gallons of water, and the seed oats were immersed in this solution and stirred occasionally for a period of twenty minutes.

(8) *Sprinkling with Diluted Formalin.* One-half pint of formalin was poured into five gallons of water. The oats were then sprinkled with this solution and carefully stirred until the grain was thoroughly moistened.

After the treatments had been made for a few hours, the grains were carefully sown on separate plots, each of which was exactly twenty-five links long by twenty-five links wide. When the winter wheat was about ready to cut, it was carefully examined and the smutted heads were picked out and shelled. The rest of the crop was then threshed and again examined for the smut balls. When the oats were coming into head they were examined frequently and all smutted heads removed and carefully counted. The tables which follow give the average results in percentage of smutted grains of winter wheat and of smutted heads of oats in each of the five years during which each experiment was conducted. Besides this information, the average yield of oats per acre for the five years and the average yield of winter wheat per acre for three years are included.

TREATMENT OF OATS FOR SMUT.

Materials.	Percentage of smut.						Average yield of grain per acre 5 years.
	1st year test.	2nd year test.	3rd year test.	4th year test.	5th year test.	Average of 5 yrs.	
							bus.
1. Untreated	5.5	3.9	11.6	4.3	3.4	5.7	60.3
2. Hot water	.0	.0	.0	.1	.0	.0	63.7
3. Bluestone—5 minutes	1.7	.9	.7	.6	.1	.8	58.5
4. Bluestone—12 hours	.6	.0	.0	.1	.0	.1	56.0
5. Bluestone—sprinkled	.9	2.0	1.4	.6	1.6	1.3	61.8
6. Potassium Sulphide	3.4	.1	.3	1.5	.7	1.2	66.2
7. Formalin—Immersed	.0	.0	.0	.0	.0	.0	68.3
8. Formalin—Sprinkled	.0	.1	.0	.0	.0	.0	61.3

TREATMENT OF WINTER WHEAT FOR SMUT.

Materials.	Percentage of smut.						Average yield of grain per acre 3 years.
	1st year test.	2nd year test.	3rd year test.	4th year test.	5th year test.	Average of 5 yrs.	
							bus.
Untreated	3.6	9.3	.6	.6	6.8	4.2	38.0
Hot water	.0	.0	.0	.0	.0	.0	40.6
Bluestone—12 hours	.0	.0	.0	.0	.0	.0	40.2
Bluestone—Sprinkled	.0	.2	.0	.0	.1	.1	41.1
Formalin—Immersed	.0	.0	.0	.0	.0	.0	43.3
Formalin—Sprinkled	.0	.0	.0	.0	.0	.0	36.3

The results of all the experiments show that the greatest yield of both winter wheat and oats per acre were produced from the grain which was immersed in a solution made by adding one pint of formalin to forty-two gallons of water for a period of twenty minutes. It will also be seen that this treatment was, in fact, the most effectual of all the treatments in completely preventing the trouble from the smut. Of the different bluestone treatments for smut in oats the most effectual was treatment No. 4, but that treatment, however, was not as satisfactory as the use of the formalin solution in which the grain was immersed. It will also be noticed that No. 3 and No. 4 treatments seem to injure the germination

of the grain slightly; they thus reduce the yield per acre. It will also be noticed that the sprinkling with the formalin treatment reduced the yield of winter wheat per acre, the average being nearly two bushels per acre less than the crop produced from the untreated seed. The results of all these experiments go to show the excellent satisfaction which has been obtained by immersing both oats and winter wheat for twenty minutes in a solution made by mixing one pint of formalin with forty-two gallons of water. This treatment is easily applied, comparatively cheap, effectual in killing the smut spores, and also effectual in producing the largest average yield of both wheat and oats per acre of all the treatments used.

For two or three years, an experiment was conducted in duplicate by sowing each of two varieties of oats, the seed being of all ages. The grain contained smut spores and was not treated. The idea of the experiment was to ascertain whether or not the smut spores would lose their vitality more quickly than the oat grains. For this experiment, therefore, seed which was one year and two, three, four and five years old was selected for the test. It was found, however, that instead of the smut decreasing with age, that the older the grain the greater was the proportion of smut. This seemed to indicate that the smut spores remained vital when stored with the grain in a dry place for at least five years. It also seemed to indicate that owing to the weakened condition of the oat plants caused by the age of the seed, it enabled the smut to attack the weakened plants quite readily. It therefore appears to be useless to attempt to try and eliminate the smut from grain by the use of old seed.

Varieties of Spring Barley.

Barley growing in Ontario has had rather a checkered experience during the past quarter of a century. Before the passing of the McKinley Tariff in 1890 the barley crop was grown quite extensively in this province, especially in the vicinity of Lake Ontario. Ontario barley at that time commanded a high price in the American market. After the passing of the McKinley Tariff, however, the American trade diminished and the acreage devoted to this crop decreased from year to year until 1898 when there were only 438,784 acres of barley grown in the Province. In recent years, however, there has been a comparatively steady increase in the area devoted to this crop. During the last few years the amount of barley grown in Ontario has averaged about 700,000 acres annually. Besides the total amount of barley grown the average yield per acre shows results which are quite interesting. The average yield of barley per acre from 1886 to 1893 was 24 bushels; from 1894 to 1901, 27.1 bushels and from 1902 to 1911, 30.5 bushels. It will, therefore, be seen that there has been a very marked increase in the yield of barley per acre during recent years. This is probably due to a considerable extent to the introduction of higher yielding varieties which have been introduced recently.

The three principal classes of barley which have been grown under experiment at Guelph are the six-rowed, the two-rowed and the hulless varieties. The varieties of these different classes also vary considerably, as for instance, of the six-rowed barleys some are bearded and some are beardless. This also holds true of the hulless barleys. The hulless barleys are represented by both six-rowed and two-rowed varieties. In presenting the results in tabulated form the three general classes are kept distinct.

AVERAGE RESULTS OF BARLEY FOR SIX YEARS.

Classes and Varieties.	Bearded or bald.	Color of grain.	Average height.	Per cent. of rust.	Days to reach maturity.	Weight per measured bushel.	Yield per acre 5 years. Straw	Grain.
SIX-ROWED:			inches.			lbs.	tons.	bush.
Mandscheuri	Bearded	White	36	3	102	49.52	2.04	**76.60**
California Brewing	"	"	30	7	103	46.16	1.88	**74.02**
Oderbrucker	"	"	36	4	101	49.77	1.93	**69.89**
Common six-rowed	"	"	36	4	100	50.10	1.89	**65.98**
Mensury	"	"	34	5	100	51.12	1.95	**65.40**
Zulu King	"	Black	28	8	101	48.82	1.56	**60.71**
Success	Bald	White	33	4	94	46.38	1.57	**54.97**
TWO-ROWED:								
Imported No. 5591 (Iowa)	Bearded	White	32	4	107	52.25	2.11	**64.39**
Hanna No.5590(Iowa)	"	"	32	4	106	53.13	1.95	**62.12**
"Jarman's Selected								
Beardless	"	"	32	4	107	52.92	1.99	**61.96**
French Chevalier	"	"	32	6	113	51.21	2.03	**50.96**
Two-rowedCanadian	"	"	33	6	109	51.85	1.96	**47.02**
Duckbill	"	"	33	8	109	50.88	1.92	**44.81**
HULLESS:								
Guy Mayle	"	Green	25	4	97	60.14	1.71	**45.94**
Purple	"	Purple	26	4	99	62.74	1.74	**45.41**
Black Hulless	"	Black	28	5	100	62.09	1.68	**43.33**
Winnipeg No. 2	"	White	25	4	102	59.34	1.83	**43.33**
Hungarian	"	"	31	5	105	57.56	1.75	**41.25**
New White Hulless	Bald	"	27	9	106	59.64	1.99	**31.55**

The six-rowed varieties of barley are grown much more extensively in Ontario than either the two-rowed or the hulless varieties. It should be remembered that a very large number of varieties of barley which have given comparatively low yields per acre have been dropped from our list after five years test. Even in spite of this, however, it will be seen that there are great variations in the six years average yield of grain per acre. It should be understood that for both the six-rowed and the two-rowed barleys, 48 pounds per measured bushel was used as the standard, but in the hulless barleys, 60 pounds per measured bushel was taken as the standard.

In the spring of 1889 one pound of the Mandscheuri barley, which was obtained from Russia through an English seed firm, was sown on a small plot in the Experimental Department with sixty other varieties. In the test of that year it gave stiff straw and a large yield of grain which was of good feeding quality, being comparatively thin in the hull and plump in the kernel. It has continued to give good results since that time, the average for the twenty-three years during which it has been under experiment being 71.8 bushels per acre per annum. This is an average of 9.3 bushels per acre per annum more than the Common six-rowed barley which it has been largely instrumental in supplanting throughout Ontario. In connection with the Ontario Agricultural and Experimental Union the Mandscheuri barley has been distributed throughout Ontario in the past eighteen years to farmers who have applied for the experiment with barley. From these small lots so distributed there are now upwards of one-half million acres of the Mandscheuri barley grown in Ontario annually. The introduction of this barley has undoubtedly had a marked influence in increasing the yield of barley per acre throughout Ontario during the last few years as referred to in a previous section of this report. It is, however, being supplanted at the present time by the O. A. C. No. 21 Barley which is one of our own selections and which will be referred to more particularly in the following paragraph.

O. A. C. No. 21 Barley.

It is undoubtedly true that the College has had a marked influence on the production of barley in Ontario; first, by the introduction, the testing and the distribution of the Mandscheuri barley from Russia; and second, by the breeding, increasing and distributing of the O. A. C. No. 21 barley as a distinct variety. In the spring of 1903 selected grains of the Mandscheuri barley were planted by hand at equal distances apart in the Experimental Department at the College. When the plants were ripe they were carefully examined and thirty-three of the most promising ones were selected, harvested and threshed separately. In 1904 these lots were sown separately in rows and these rows were carefully examined and the most important ones were harvested and threshed separately. From that time forward only the best strains were grown in the tests as follows: 14 in 1905, 8 in 1906, 7 in 1907 and three in each of the past four years. During the first year the different strains went by number and the one which has proven to be the best is what is known as the O. A. C. No. 21. This variety was distributed throughout Ontario in connection with the Experimental Union and has made a very excellent record. In each of four years in which it was compared with the Mandscheuri variety in the co-operative experiments throughout Ontario, it surpassed the latter in yield of grain per acre, in freedom from rust and in both length and strength of straw. It is an easy matter to distinguish the grain of the O. A. C. No. 21 from that of the Mandscheuri variety. From the one pounds lots of the O. A. C. No 21 barley which were distributed throughout Ontario, about twenty thousand bushels were traced in the spring of 1909. This barley has been increasing very rapidly since that time, and in 1911 it has proven the most prominent variety in the Competition of Fields of Standing Grain throughout Ontario and in connection with our largest exhibitions of threshed grain. In fact, the O. A. C. No. 21 has captured practically all of the prizes offered for six-rowed barley at the largest competitions during the last year. The history of both the Mandschueri and the O. A. C. No 21 varieties of barley shows the practicability and the influence of the system of experimental work at the College and of the co-operative experimental work in connection with the Experimental Union in its operations throughout Ontario. Through the medium of the co-operative experiments, the farmers find out for themselves which varieties are most suitable for their own particular soils. The crop produced from the most promising variety can be carefully sown in the following year. In this way the variety can be rapidly increased, not only to be used by the farmer himself, but also to be sold at an advanced price to his neighbours, to seedsmen or to buyers at a distance. It is believed that the O. A. C. No. 21 barley is the best variety which is now being grown on the farms of Ontario and that in a very short time it will be grown more extensively than any other variety in this Province.

New Introductions of Barley.

During the last three years, eleven new varieties of barley have been imported from different countries. Of this number three were introduced in 1909, three in 1910 and five in 1911. Those which were introduced in the spring of the present year all came from the noted Agricultural Experiment Station at Svalof, Sweden. Although the yields were all fairly good none of them quite reached that of the Mandscheuri variety. The greatest yield per acre of all the barleys grown in 1911 was obtained from a cross between the Mandscheuri six-rowed and the Chevalier two-rowed. This is a barley originated at the College and which was grown in the test plots in 1911 for the first time.

Varieties of Winter Barley.

Two varieties of winter barley have been grown under test at the College in each of the past five years and the results of the two varieties have been somewhat similar in average yield of both straw and grain per acre and in average weight per measured bushel. The Tennessee winter barley surpassed the Wood's winter barley by one-quarter of a bushel per acre per annum, but the last named variety came slightly higher than the other varieties in both weight of grain per bushel and in yield of straw per acre.

In each of fifteen years winter barley has been grown at the College and has given an average yield at 54.8 bushels per acre which weighed on the average 47 8 pounds per measured bushel. Within the past eighteen years winter barley has been completely killed out on three occasions. During some of the other winters it has been partially killed. When it survives the winter successfully the yield is usually high. There is, however, more risk in growing winter barley in Ontario than in growing winter wheat, as the former is not quite as hardy as the latter.

Varieties of Oats.

No less than 2,699,230 acres of oats were grown in Ontario in 1911. This is about three times as great an area as that devoted to the growing of any other cereal crop in this Province. In fact, the number of acres devoted to the oat crop in Ontario annually is almost equal to the combined areas used for all of the other small grains.

Much attention has been given to the testing of varieties and to the conducting of other experiments with the oat crop in the Department of Field Husbandry at the College. About three hundred varieties of oats have been carefully tested in the experimental grounds, but many of these have been dropped after they have been grown for five years in succession, owing to the fact that other varieties have proven more successful. Each year a few new varieties are added and a few of the inferior ones are dropped. In 1911 there were in all seventy-one varieties of oats under experiment. Of this number thirty were grown for at least six years while the others have been under experiment from one to five years. We are here appending a summary statement of some of the more important results of each of thirty varieties which have been under careful test in each of the past six years.

AVERAGE RESULTS OF VARIETIES OF OATS FOR SIX YEARS.

Varieties of Oats.	Per cent. Hull. five years.	Average Result for Six Years.						Yield per acre of grain.	
		Heads, mane or spreading.	Days to mature.	Height.	Per cent. rust.	Weight per measured bushel.	Straw per acre.	1911.	Average six years.
				ins.		lbs.	tons.	bushels.	bushels
Daubeney	25.0	S.	102	39	6	34.29	1.69	42.12	**79.89**
Siberian	29.5	S.	108	43	9	31.33	1.87	48.12	**79.70**
Iowa Silver Mine	30.8	S.	109	42	10	33.04	1.89	41.03	**78.58**
Alaska	24.1	S.	103	41	7	35.20	1.74	37.68	**78.28**
Peerless	27.8	S.	111	43	11	33.47	2.12	40.82	**78.22**
Early Champion	27.9	S.	107	43	10	33.49	1.88	46.09	**77.54**
Prosperity	26.6	S.	104	41	9	33.73	1.90	41.24	**76.12**
Newmarket	28.5	S.	109	43	12	33.75	1.83	43.85	**74.58**
Oderbrucker	30.2	S.	110	43	12	33.78	1.96	43.65	**73.76**
English Glory	28.0	S.	109	43	10	33.99	1.94	39.24	**73.56**
Probsteier	28.0	S.	110	43	11	33.70	1.84	44.56	**73.49**
Ligowa Hafer,	28.0	S.	109	42	11	34.25	1.82	45.59	**73.17**
Joanette	24.1	S.	108	36	7	32.82	2.09	38.65	**72.80**
Early Ripe	26.3	S.	99	38	6	28.56	1.74	46.09	**72.56**
Abundance	28.5	S.	109	43	10	33.62	1.86	40.29	**72.24**
Waterloo	27.9	S.	111	43	9	32.78	1.93	43.85	**71.98**
New Sensation	28.4	S.	109	42	11	33.85	1.80	43.29	**71.67**
New Zealand	29.5	S.	111	42	10	31.92	1.95	43.00	**70.94**
Yellow Russian	29.0	S.	110	41	9	33.22	1.74	39.15	**70.52**
Vick's American Banner.	29.5	S.	112	43	11	33.57	2.05	30.41	**68.78**
Liberty	29.4	S.	111	42	10	32.51	1.92	31.76	**68.59**
Egyptian	30.8	M	110	43	13	34.89	2.15	33.76	**67.85**
Bavarian	29.0	S.	110	42	7	34.09	1.99	38.65	**66.66**
Pioneer	36.6	S.	109	38	15	32.88	2.05	33.59	**65.23**
Tartar King	32.8	M.	108	43	13	33.23	1.79	33.62	**62.65**
Early Dawson	34.5	S.	104	44	12	37.55	2.08	39.68	**62.23**
Black Tartarian	30.3	M.	114	40	16	30.22	2.03	20.44	**61.26**
Storm King	34.3	M.	109	40	12	33.16	1.81	31.24	**60.30**
White Superior Scotch	33.9	S.	104	45	12	38.23	1.98	38.41	**58.31**
Hulless Oats	.....	S.	108	44	8	.....	2.48	22.29	**43.25**

Although a very large number of the poorer varieties have been dropped from the list from year to year, it will be seen that there are still very marked differences in the results of the different varieties included in the tabulated statement here presented. In the percentage of hull there is a variation from 24.1 for the Alaska and for the Joanette to 36.6 for the Pioneer. It will, therefore, be seen that in the average of six years' results either the Joanette or the Alaska variety of oats will surpass the Pioneer variety by fully twelve pounds of meal per hundred pounds of grain. There are but few people who realize that there is such a marked difference in the quality of oats. A great many people think that the weight of oats per measured bushel is a good indication of the quality of the grain. In very many instances this conclusion is entirely wrong, as will be observed from a careful study of the accompanying table. The Early Dawson oats weigh over 37 pounds per measured bushel, and has upwards of 34 per cent. of hull, while the Daubeney variety weighs three pounds less per measured bushel, and has nearly ten per cent. less hull. It will, therefore, be seen that the Daubeney, although weighing much lighter in weight per bushel, is decidedly better in quality than the Early Dawson variety. Again, compare the White Superior Scotch with the Alaska, or the Egyptian with the

Joanette and it will be seen in all of these cases, as well as in several others, that the oats which weigh the most per measured bushel, are frequently of poor quality. It will also be seen that a number of varieties of oats which only weigh about the standard number of pounds per measured bushel have frequently thin hull, and are therefore of high quality.

It has already been explained in a former portion of this report that both the Daubeney and Alaska varieties of oats have given good satisfaction for mixing with Mandscheuri barley. It will be seen that both these varieties of oats not only stand high when grown by themselves, but also produced grain of excellent quality, the amount of hull in either case not surpassing twenty-five per cent.

Oats Obtained Through the Process of Plant Breeding.

During the last few years a large amount of work has been carried on with the object of improving some of the leading varieties of oats through selection and cross-fertilization. For the work of selection thousands of seeds of each of a few varieties have been planted by hand and new strains have been started from the best individual plants.

In the Spring of 1911 what is now known as the O. A. C. No. 72 variety of oats was distributed throughout Ontario for co-operative experiments. This particular strain was started from a single plant selected from over nine thousand plants of the Siberian variety of oats which were grown in a nursery plot. The returns from experimenters throughout Ontario which have been received up to the present time seem to indicate that this new strain of oats has made a very good record indeed throughout Ontario during the past year when compared with other varieties; such as Lincoln, Regenerated Abundance and Siberian. It is a variety which has given very good straw, both in length and in strength, and the yield this year throughout the Province, considering the season, has apparently been satisfactory to the great majority of the experimenters, who speak highly of this new oat.

In the Spring of 1906, we sowed for the first time, some seed of the Yellow Kherson, and of the Sixty-day varieties of oats. This seed was obtained from the State of Kansas. After the first year's trial it was found that both samples were badly mixed. We, therefore, made a very careful seed selection, and in the following year sowed the best seed obtainable of both the white and the yellow kernels of each of the two varieties. We have continued to experiment with these four carefully selected lots from that time to the present, and the results now show that the yields have been particularly high from some of these strains. The seed will probably be increased in 1912, and a fuller report will likely be presented at the end of another season.

We have a large number of new varieties of oats which we have originated at the College through cross-fertilization, but as yet we are not prepared to present the results, further than the statements which have already been given in a former portion of this report.

The Stooling of Oats.

During the last three or four years non-stooling oats have been strongly recommended by an English seed firm, which is now doing considerable trade in selling seed grain in Canada, especially in the Western Provinces. As the results of investigations on the influence of the stooling of grains appeared very meagre we thought it wise to start some experiments, with the object of trying to obtain some definite

information on this important question. While it is true that the stooling of the grains is influenced by the fertilty of the soil, the conditions of the weather, etc., it is also true that it is influenced by the variety of the grain and by the thickness of the sowing. The fertility of the soil, the thickness of the sowing, and the varieties used are largely under the control of the farmer. Therefore the stooling or the tillering of the grain crops forms an exceedingly important subject for study and investigation. Outside of some work conducted in the State of Wyoming, there seems to be but little trace of any valuable experiments conducted on the stooling of grain in America. In the results of our own experiments in each of the past three years, the varieties of oats have shown very marked differences in stooling properties. We here present the average of three years' results of each of a number of varieties of oats which are as follows:

Varieties.	Average Number of Stools per plant (3 years).
Joanette	18
Burt	18
Abundance (Regenerated)	18
Early Ripe	16
Yellow Kherson	16
Daubeney	15
Sixty Day	14
American Banner	14
Siberian	12
Storm King	7
Tartar King	7

The seed of the varieties here mentioned was sown in rows one foot apart and the plants were allowed to stand one foot apart in the rows so that it would give a good opportunity for the development of stools of the individual plants and bring out the characteristic of the different varieties in this respect. It will be seen that there is a variation in the average number of stools, from seven in the case of the Storm King and Tartar King to eighteen in the case of Joanette, Burt, and Regenerated Abundance. The American Banner and Siberian occupy an intermediate position between those which stool the least and those which stool the most.

In each of the past three years an experiment has been conducted in our experimental plots by planting the seed of each of four varieties of oats at different distances apart. No less than 90 plots were used for this experiment in each of the past three years. We are not prepared to give the details of this experiment as we wish to continue it for several years before presenting the results and drawing the conclusions therefrom. It might be stated in a general way, however, that those varieties of oats which are heavy stoolers appear to adapt themselves better to conditions than those which are very light stoolers. This has been brought out more particularly in the results of the experiments in the past two years.

Special Consideration Regarding the Amount of Hull of Oats.

The quality of oats is determined largely by the amount of hull which they contain. The hulls of oats are not much different in conposition from the oat straw. The difference in percentage of hull of the varieties is, therefore, of very

great importance, especially when buying oats for the manufacture of oatmeal or for the purpose of feeding. In order to get a fairly good knowledge of the quality of oats it is not necessary to make a chemical analysis, but simply to make a determination of the amount of hull. This can be accurately done by weighing a certain number of the kernels and then by weighing the hulls after they have been removed from the grain. A fairly good estimate can often be made by simply examining the kernels carefully and removing the hulls, after which they can be examined in comparison with the kernels when the hulls have been removed. Not only are there very great variations in the amount of hull in the varieties of oats in a single year, but it is found that the relative percentage of hull in different kinds of oats is fairly constant from year to year. A variety, for instance, which shows itself to be thin in the hull for two or three years is almost sure to be thin in the hull for a longer period of time. This also holds true in those varieties of oats which have a large amount of hull. The following table gives the percentage of hull of each of four varieties of oats in each of ten years and also the average percentage of hull of each variety for the whole period:

Varieties.	Percentage Hull.										
	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	Av. 10 yrs.
Joanette.....	22.5	23.1	22.5	24.0	25.2	23.4	23.9	25.4	23.9	23.9	**23.8**
Daubeney	26.1	25.1	23.0	26.3	26.3	24.7	23.8	25.4	24.9	26.2	**25.2**
Early Dawson ..	32.6	33.7	32.4	36.0	38.1	33.7	36.6	36.8	31.4	34.1	**34.5**
Pioneer.....	48.1	36.8	36.9	36.8	42.8	38.8	37.4	36.7	33.5	36.8	**38.5**

It will be seen from an examination of the table giving the percentage of hull of each of four varieties of oats in each of ten years that, with only two or three exceptions, the same order of the varieties in regard to hull production was followed in each of the ten years. The Joanette and the Daubeney were thin-hulled varieties in every case, the highest percentage of either variety in any one year being 26.3. In comparison with these the Early Dawson and the Pioneer varieties produced thick-hulled oats in every instance, the lowest percentage of either variety being 31.4, or practically five per cent. greater than the highest percentage of the two thin-hulled varieties. It will also be noticed that there is a variation in the thickness of the hull from 22.5 for the Joanette in 1902, to 48.1 for the Pioneer in the same year. It will be seen from an earlier portion of this report that in the average of six years experiments, the Daubeney gave a yield of practically 80 bushels and the Pioneer only about 65 bushels per acre. During the same period of time the oats of the Daubeney variety weighed only 34.3 pounds while those of the Early Dawson variety weighed 37.6 pounds per measured bushel. It will, therefore, be seen that thin hulled varieties of oats are not necessarily light yielders and that thick-hulled varieties of oats may give heavy weights per measured bushel and also be light yielders of grain.

Simply the difference in the average amount of hull of the Joanette and the Pioneer varieties of oats as represented in these results, if applied to the whole Province of Ontario would make a difference in the annual value of the oats grown in Ontario of fully four million dollars. If in connection with these estimates the yield per acre as well as the perecentage of hull were taken into consideration the difference in the money value would be considerably greater than the amount here stated.

Classification of Wheat.

According to some authorities, there are seven, and according to other authorities there are eight, distinct types or species of wheat when judged from a botanical standpoint. We have, in the past, been adhering to the classification which includes the seven types. I present this classification, as it will give the reader a better understanding of a number of varieties which are now grown throughout the Province. The species are as follows:

(1) Common, fine, or soft wheat (*Triticum vulgare*).
(2) Turgid, or toulard wheat (*T. turgidum*).
(3) Hard, or flinty wheat (*T. durum*).
(4) Polish wheat (*T. polonicum*).
(5) Spelt (*T. spelta*).
(6) Emmer, or starch wheat (*T. dicoccum*).
(7) One-grained wheat (*T. monococcum*).

All of these different types of wheat are represented by varieties which have been grown in the plots at the Ontario Agricultural College, and at least three of them, viz., (1), (3) and (6) are grown considerably in field cultivation throughout the Province.

For practical information it seems best, however, to report on the wheats under a more popular classification than the one here presented. The greater number of wheats of both the winter and the spring varieties which are grown in Ontario belong to the first class and are used very largely for the production of flour. Other wheats which are grown and are sometimes shipped to Southern Europe for the manufacture of macaroni, belong mostly to types (3) and (4), and the wheat which is grown more particularly for the production of feed for farm stock belongs to types (5) and (6).

Varieties of Winter Wheat.

Fully two hundred and sixty-six varieties of winter wheat, besides a large number of selections and crosses, have been grown at the Agricultural College within the past twenty-two years. Practically all varieties have been tested carefully for five years in succession, after which inferior kinds have been discontinued and those which have made the highest records have been used in the experiments of the following years. In the present year eighty-one different lots of winter wheat were carefully tested under uniform conditions. These included thirty-three named varieties, thirty-four hybrids and several straight selections. Of the named varieties, seven have been grown for less than five years and twenty-six varieties for five or more years. Fourteen varieties of winter wheat have been grown in each of the past sixteen years and the results of these are, therefore, of special value. The following table gives for each of these fourteen varieties, the average weight per measured bushel for fifteen years, the yield of grain per acre for 1911, and the average yield of both straw and grain per acre for the sixteen-year period:

Variety.	Color of Grain.	Pounds per measured bushel. 15 years.	Yield per Acre. Bushels grain 1911.	Average 16 years. Tons straw.	Average 16 years. Bushels grain.
Dawson's Golden Chaff	White	60.3	55.1	3.1	**54.1**
Early Genesee Giant	White	60.6	55.7	3.2	**49.8**
Imperial Amber	Red	61.1	43.7	3.3	**49.2**
Early Red Clawson	Red	59.5	57.9	3.0	**48.7**
Egyptian Amber	Red	61.8	42.2	3.4	**47.7**
Rudy	Red	61.6	52.3	2.8	**46.7**
Kentucky Giant	Red	61.6	52.2	3.0	**45.4**
Turkey Red	Red	61.7	50.8	2.9	**45.2**
Geneva	Red	62.5	47.4	3.1	**45.1**
Tasmania Red	Red	61.9	42.0	3.0	**44.8**
Tuscan Island	Red	61.3	47.6	3.0	**44.5**
Treadwell	White	60.9	51.1	2.9	**44.4**
Bulgarian	White	61.2	51.3	2.9	**44.1**
McPherson	Red	62.2	57.0	2.8	**43.6**

The average results of the fourteen varieties are as follows: weight per measured bushel, 62.2 lbs. for 1911 and 61.3 lbs. for the fifteen-year period; yield of straw per acre, 2.7 tons in 1911 and 3 tons for the sixteen-year period; and yield of grain per acre, 50.5 bushels for 1911 and 46.7 bushels for the sixteen-year period. These results show that in the experiments at the College for 1911, the winter wheat gave a yield of grain and a weight per measured bushel slightly higher than the average of the past few years, but that the yield of straw was a little below the average in 1911.

The Dawson's Golden Chaff winter wheat is grown more extensively in Ontario at the present time than any other variety. It will be seen that it has given the highest yield of grain per acre of the fourteen varieties which have been grown at the College in each of the past sixteen years. It produces a very stiff straw of medium length, beardless heads with red chaff and white grain which weighs about the standard per measured bushel. The grain of the Dawson's Golden Chaff has been somewhat soft, but it appears to be improving in quality for bread production. The Early Genesee Giant, sometimes classed as a white and sometimes as an amber wheat, possesses a medium length of straw with a short compact, bearded head. The Imperial Amber produces a large amount of straw which is somewhat weak, a bearded head with red chaff, and a red grain of average quality. The early Red Clawson has a comparatively weak straw and grain of poor quality. The grain of the Tuscan Island, Rudy, Tasmania Red, Kentucky Giant, Turkey Red and McPherson is hard and weighs well per measured bushel, but the straw is somewhat weak.

Twenty-six varieties of winter wheat, grown in 1911 have been under experiment for at least five years. In the five years' test, the highest yields of grain per acre of the named varieties have been produced by the Dawson's Golden Chaff (50.1) bushels) and three other varieties which resemble it very closely and which have yielded as follows: American Wonder, 52.9 bushels; American Banner, 52.7 bushels; and Abundance, 50.1 bushels. The highest yields produced by varieties

of other types in the five years' experiment are as follows: Crimean, 45.8 bushels; Early Genesee Giant, 44.9 bushels; Banatka, 44.7 bushels; No. 5 Red, 44.3 bushels; and Turkey Red, 43.3 bushels. The heaviest weights of grain per measured bushel in the five years' test have been produced by the Northwester, 63.8 lbs.; Rudy, 63.2 lbs.; Egyptian Amber, 63.1 lbs.; Geneva, 63.1 lbs.; Banatka, 63 lbs.; Kentucky Giant, 63 lbs.; Crimean Red, 62.9 lbs.; and Turkey Red 62.9 lbs.

Of the thirty-three named varieties of winter wheat, grown in 1911, the greatest yields of grain per acre were produced by the Gillespie Red, 64.9 bushels; Gillespie White, 61.6 bushels; American Banner, 58.7 bushels; Winter Red Fife, 58.2 bushels; Early Red Clawson, 57.9 bushels; Scott, 57.8 bushels; No. 5 Red, 57.6 bushels; and Crimean Red, 57.6 bushels; and the heaviest weights per measured bushel by the Northwester, 64.4 lbs.; Turkey Red (Alberta), 63.7 lbs.; Nigger, 63.5 lbs.; Theiss, 63.5 lbs.; and Rudy, 63.4 lbs.

In each of the past four years, the varieties of winter wheat grown in the Experimental Department were carefully tested for bread production in the Bakery branch of the Chemical Department of the College. The varieties of winter wheat which produced the largest loaves of bread from equal quantities of flour in the average of the tests made in 1907, 1908, 1909 and 1910, are as follows: Banatka, Crimean Red, Tuscan Island, Yaroslaf, Buda Pesth, Rudy, Tasmania Red, Kentucky Giant, Scott, Egyptian Amber, Turkey Red, and Treadwell.

A considerable amount of work has been done at the College during the last few years with the object of improving some of the best varieties of winter wheat by means of systematic selection and cross-fertilization. Some of the most interesting crosses have been obtained by hand cross-pollenation of the Tasmania Red, Buda Pesth, Turkey Red and Imperial Amber with the Dawson's Golden Chaff. In 1911 crosses were made between the Crimean Red and the American Wonder. In most cases the white wheats are comparatively soft but it is interesting to note that some of our new white wheats, obtained by crossing the Dawson's Golden Chaff and the Tasmania Red, are harder in the grain than any of the named varieties of winter wheat which we have tested at the College. Owing to the earliness of the season in which this report is being issued, it is impossible to report on the cross-bred varieties at the present time.

Varieties of Spring Wheat for Flour Production.

There is a comparatively small amount of spring wheat grown in the Southwestern part of Ontario. In the Eastern and Northern sections, however, it is still grown to a considerable extent. Taking the Province as a whole there were 133,711 acres of spring wheat in 1911. This is 4,392 acres more than were grown in the year previous. Although the season of 1911 was very unfavorable for the growth of a number of our farm crops, the statistical reports of Ontario show that the yield of spring wheat per acre was greater in Ontario by 5.3 bushels than the average yield for the past thirty years. Not only have we had under experiment, the different varieties of spring wheat in Ontario but we have imported other kinds from various countries of the world and have tested them under similar conditions with those which have been grown in this Province. The following table gives the average results of five years' tests with each of fifteen varieties of spring wheat grown at the College:

Varieties.	Bearded or Bald.	Color of grain.	Average height.	Per cent. rust.	Days to reach maturity.	Weight per measured bushel.	Yield per acre.	
							Straw. tons.	Grain. bus.
			ins.					
Carleton	Be.	Red	44	9	119	61.34	1.89	**32.44**
Climax	Be.	Red	42	6	118	61.10	1.75	**32.35**
Saxonka	Be.	Red	43	7	118	61.35	1.71	**31.91**
Red Fife	Ba.	Red	41	9	119	39.75	1.73	**31.70**
Minnesota No. 163	Ba.	Red	40	8	119	59.66	1.80	**31.58**
Hungarian	Be.	Red	36	5	115	62.60	1.66	**30.64**
Pringle's Champion	Be.	Red	43	6	118	60.98	1.67	**30.46**
Wellman Fife	Ba.	Red	41	10	120	59.77	1.79	**30.21**
Red Fern	Be.	Red	42	8	118	61.25	1.60	**28.31**
Herison Bearded	Be.	Red	40	6	119	62.86	1.64	**28.18**
White Russian	Ba.	Red	40	9	121	59.68	1.69	**28.05**
Preston	Be.	Red	40	9	117	59.97	1.50	**27.09**
Early Java	Be.	Red	40	7	117	61.46	1.70	**26.85**
Colorado	Be.	Red	40	7	115	60.73	1.57	**25.31**
Gatineau	Be.	Red	40	6	121	60.20	1.62	**24.33**

The results show a variation from 24.3 bushels per acre for the Gatineau to 32.4 bushels for the Carleton. The well-known Red Fife spring wheat stands fourth in yield per acre but is surpassed by the Carleton variety by an average of only about three-quarters of a bushel per acre. According to reports the Red Fife variety was introduced by Mr. David Fife, an Ontario farmer, who, in 1842, received from a friend of his in Scotland a small sample of wheat obtained from a carload which had arrived from Dantzic on the Baltic Sea. This small lot was sown by Mr. Fife as a spring wheat but evidently it was a winter wheat as only one plant produced heads. The three heads which were obtained furnished seeds which were sown in the following year and gave good results. From that small start the Red Fife wheat has become one of the best-known varieties on the American continent. Besides being a good yielder, the wheat itself is usually of excellent quality. It has formed a basis of a number of other varieties which have been obtained from it through selection; such as Minnesota No. 163, Wellman Fife, etc.

Varieties of Macaroni Spring Wheat.

Although the durum or macaroni wheats are perhaps not known generally throughout Ontario under these names, there is one variety which belongs to this class and which is pretty generally known throughout the Province under the special name of Wild Goose. People who have grown this variety have realized that it is a wheat considerably different from the ordinary varieties of spring wheat. They do not realize, however, that it belongs to a different species of spring wheat from that represented by the Red Fife, Colorado, Red Fern and a number of other varieties which are grown throughout the Province. The durum class of wheat is grown quite extensively in some countries for the manufacture of macaroni and the varieties representing this class are frequently spoken of as macaroni wheats. In Ontario the Wild Goose variety has been exported quite extensively in some years to European countries for macaroni purposes. It is, however, being more extensively used for flour production in Ontario than formerly. Although it requires more power to convert the macaroni wheat into flour than is required by most of the other varieties, the millers are realizing that it is a wheat

of good quality and find that they can handle it more readily than other varieties, and a small proportion of this wheat improves the strength of the flour made from the winter wheats grown in Ontario. Some varieties of macaroni wheats have been grown at our College for a long period and others for a shorter length of time. The following table gives the results of five years' experiments for each of seven varieties of macaroni wheats:

Varieties.	Average results for 5 years.				Average results for 5 years.		
	Bearded or Bald	Average Height.	Per cent. of Rust.	Days to reach Maturity.	Weight per measured bushel.	Yield of straw per acre.	Yield of Grain per acre.
		ins.				tons.	bus.
Roumania	Be.	42	6	118	62.98	1.73	33.35
Arnautka (1537)	Be.	43	5	118	62.86	1.72	31.46
Wild Goose	Be.	40	10	120	62.00	1.72	31.36
Kubanka	Be.	42	8	118	62.23	1.74	29.82
Medeah	Be.	44	5	114	60.83	1.60	29.02
Sorentina	Be.	43	9	117	59.94	1.74	27.57
Iumillo	Be.	36	11	117	61.97	1.70	26.96

The Roumania wheat has surpassed in yield per acre the Wild Goose variety in the average of five years to the extent of about two bushels per acre.

Each of three varieties of the macaroni wheats have been grown in the experimental grounds for nineteen years in succession, and the following table gives the average results of the weight per measured bushel and the yields of straw and grain per acre for this period:

Varieties.	Weight per measured bushel.	Yield per acre.	
		Tons of straw.	Bushels of grain.
Wild Goose	61.7	2.1	37.5
Medeah	60.4	2.0	33.7
Sorentina	59.6	2.1	32.6

It will, therefore, be seen that the Wild Goose variety has made a high record over Ontario when a long period of time is taken into consideration.

Emmer and Spelt for the Production of Grain for Feeding Purposes.

Emmer and Spelt represent two species of spring wheat. Although Emmer and Spelt have been grown at the College more or less for fully twenty years, the last named grain is scarcely ever grown in Ontario, but the Emmer has been grown as a field crop in many sections, although in many cases it is improperly called Spelt. Each of these two types or species of grains contains a number of varieties. Both are used for grinding into meal for feeding to farm stock, owing to

the fact that the chaff adheres to the grain and is not removed in the process of threshing. The following table gives the average of ten years results of each of three varieties of Emmer and three varieties of Spelt which have been grown at the College:

Classes of Crops.	Varieties.	Average results for 10 years.			Weight per measured bushel. Average of 9 years.	Average results for 10 years.	
		Per cent. rust.	Per cent. of crop lodged.	Per cent. of hull.		Straw per acre, tons.	Grain per acre, lbs.
Emmer.....	Common....	3	32	21	39.5	2.0	2,872
	Iowa	2	26	20	39.9	1.8	2,769
	Russian	2	27	21	39.9	1.8	2,742
Spelt.....	Alstroum ...	16	4	30	25.6	1.6	2,115
	Red	13	4	29	28.0	1.6	2,100
	White	13	4	31	27.8	1.5	1,933

Black Winter Emmer.

A study of the table here presented shows a very marked difference in the results of the two classes of grain. The Emmer is comparatively free from rust, contains a light hull and gives a good yield of grain per acre, while the Spelt has much more rust; has a comparatively thick hull, and produces a much lighter yield of grain per acre than does the Emmer. It will be noticed, however, that straw of the Emmer is not as stiff as that of the Spelt. The common variety of Emmer has given an average of 2,872 pounds of grain per acre per annum. This is a large yield, but it is not very much greater than that of each of the other two varieties included in the experiment. It will, therefore, be seen that the different varieties of Emmer all stand high in grain production. It should also be remembered that the percentage of hull in the Emmer is lower than that of oats. The average variety of oats will contain nearly fifty per cent. more hull than the average variety of Emmer. In experiments which have been conducted at some of the Experiment Stations in the United States, Emmer has given results about equal to barley for feeding purposes.

Polish Wheat and Seven Headed Wheat.

There are two types or species of wheats, regarding which much has been written in recent years and which have not appeared in the results already presented. The Polish wheat (*Triticum polonicum*) is represented in the experiments by one variety known as the Polish wheat and the Turgid, or Toulard or Egyptian (*Triticum turgidum*) is represented by a variety known as the Seven Headed. The Polish wheat has been very extensively advertised in the Western States under the name of Corn Wheat and has been sold at particularly high prices. The Alaska wheat which is a representative of the other species here referred to, has also been extensively advertised and sold at high prices. We are, therefore, presenting the results of both the Polish and the Seven Headed varieties of wheat in comparison with those of the Red Fife and the Wild Goose. Of the seven types or species of wheat there is a clear separation of the grain and the chaff of four of these types when the grain is threshed. In the other three, however, the chaff adheres to the grain even after it has been threshed with a separator. The table here presented gives the yield per acre in each of fifteen years of a leading variety of wheat in each of the four species in which the grain and the chaff is easily separated.

Year.	Red Fife. (Triticum vulgare)	Wild Goose. (Triticum durum)	Polish. (Triticum polonicum)	Seven Headed. (Triticum turgidum)
	Bushels.	Bushels.	Bushels.	Bushels.
1897	20.7	23.1	16.3	6.5
1898	34.2	48.3	27.1	24.7
1899	39.2	44.5	24.5	26.4
1900	46.3	48.4	34.5	39.4
1901	24.1	32.1	15.6	22.2
1902	31.9	33.5	29.1	25.0
1903	43.5	47.1	32.8	34.3
1904	22.2	47.1	20.1	33.2
1905	35.9	41.5	28.7	30.8
1906	33.9	36.0	19.5	28.2
1907	28.0	33.2	18.7	19.1
1908	36.3	25.6	23.8	24.5
1909	40.1	34.8	20.4	25.7
1910	44.0	49.2	30.6	37.5
1911	9.8	14.0	1.7	5.2

The tabulated results here presented show the highest yield per acre from the Wild Goose variety and the second highest from the Red Fife. Both the Polish and the Seven Headed varieties have given decidedly lower yields per acre than either of the other two. This holds true in those years in which the yields are all low as well as in those years in which the yields are all comparatively high. Decidedly the lowest yields obtained in any one year were those of 1911. A study of the table will show the great influence which the season exerts on the productiveness of spring wheat of any one of the four different types. The variations in yield per acre extended from 9.8 to 46.3 for the Red Fife, from 14 to 49.2 for the Wild Goose, from 1.7 to 34.5 for the Polish and from 5.2 to 39.4 for the Seven Headed. It will, therefore, be seen that the order in yield per acre of the different varieties was the same whether the lowest or the highest yields were taken into consideration.

It will be clearly seen that it is not always the grain which is advertised the most extensively and sold at the highest prices in the Western States that will give the most satisfactory results in this Province. The Government of Ontario is doing much to protect the farmers by an extensive system of experiments conducted at the Ontario Agricultural College and through the medium of the Experimental Union. If farmers pay high prices for largely advertised grains, without knowing their records in Ontario, they have themselves to blame. We believe that there is not the same danger of being deceived by extensive advertisements at the present time as there was some years ago.

Varieties of Rye.

The amount of land on which rye was grown in 1911 was 98,652 acres, or an increase of 3,255 acres over the year previous. This includes both the spring and the winter varieties, although the winter varieties are grown the more extensively. Rye is grown for both the grain and the straw, and furnishes a very good nurse crop with which to seed alfalfa, clovers and grasses.

Varieties of Spring Rye. Three varieties of spring rye have been grown under similar conditions at the College in each of the past seven years. The spring rye usually makes a somewhat shorter growth and gives a lighter yield of grain per acre than the winter varieties. It is a rapid grower, however, and is usually free from smut and from rust. The following table gives the average results for seven years for each of the three varieties of spring rye:

Varieties.	Weight per measured bushel.	Straw per acre	Grain per acre.
	lbs.	tons.	bus.
Petkos	55.6	2.05	**30.0**
Prolific Spring	55.3	1.94	**27.0**
Common	55.4	1.89	**26.9**

It will be seen from the accompanying table that the Petkos spring rye stands at the head of the list in yield of straw per acre, in weight per measured bushel and in yield of grain per acre. This variety was reported previous to 1910, under the German name of Saatroggen. The writer made a special trip of about seventy-five miles from Berlin, Germany, to visit the greatest rye breeder in that country. From a little seed obtained of a special rye which had been carefully bred for years a start was made in securing a rye which has given exceptionally good results in Ontario. This variety, however, gave very poor results at first, as only a few of the plants produced seed. More recently, however, it has surpassed the other varieties.

Another variety or strain of rye has been obtained by our College through selection from an individual plant of the Petkos rye. This new selection has surpassed the Petkos rye in yield per acre and was distributed throughout Ontario in the spring of 1911 for co-operative experiments under the name of O.A.C. No. 61. According to the reports which have been received in comparing the O.A.C. No. 61 rye with the Common spring rye of Ontario it has made a very good record. The O.A.C. No. 61 rye stands the highest at the present time in the records of the spring ryes in the experiments at the Ontario Agricultural College and in the co-operative tests throughout Ontario.

Winter Rye. Four varieties of winter rye have been under experiment at the College in each of the past eight years, and the following average results in yield of grain per acre and in weight of grain per measured bushel have been obtained: Mammoth White, 59.6 bushels, 57.5 lbs.; Washington, 55.9 bushels, 57.7 lbs.; Common, 53.5 bushels, 56.8 lbs.; and Thousand Fold, 53.2 bushels, and 57.3 lbs. In 1911 the Mammoth White variety gave a yield of 50.8 bushels per acre. During the past eight years the Mammoth White variety gave the greatest yield per acre in each of six years and gave the second highest yield per acre in each of the other two years. The four varieties of rye ripened at the same time. The Mammoth White and Common varieties of rye possess stiffer straw than the Washington or Thousand Fold varieties.

O. A. C., No. 61, Spring Rye.

Varieties of Buckwheat.

The number of acres of buckwheat in Ontario was 113,039 in 1908, 140,605 in 1909, 194,931 in 1910 and 189,039 in 1911. It will, therefore, be seen that in the last four years there has been a very large increase in the area devoted to buckwheat growing in the Province of Ontario. This increase is probably due to several causes, such as, its value as a smothering crop for the eradication of weeds, the lateness at which the crop can be sown in the season and the comparatively good yields of grain which can frequently be obtained from land which is only of fair quality. The following table gives the average results of seven years' tests with each of five varieties of buckwheat:

Varieties.	Weight per measured bushel.	Straw per acre.	Grain per acre.
		tons.	bus.
Rye Buckwheat	52.0	1.98	31.0
Common Grey	46.1	2.57	23.1
Japanese	44.4	2.56	20.9
Silver Hull	50.6	2.58	20.6
New Calcutta	48.6	2.72	19.0

The common buckwheat of Ontario is surpassed in average yield per acre per annum by the Rye buckwheat by about eight bushels. The Rye buckwheat has also surpassed the Common Grey in weight per measured bushel by about six pounds. The Rye buckwheat has not been surpassed in yield of grain per acre by any other variety in any one of the past seven years. Although the yields in 1911 were comparatively low the Rye buckwheat gave 19 bushels; the Common Grey, 14 bushels; the Japanese, 14 bushels; New Calcutta, 10 bushels; and the Silver Hull, 9 bushels per acre. It will, therefore, be seen that the Rye buckwheat has surpassed the other varieties in the poor seasons as well as in the good seasons. The flour of the Rye buckwheat, as compared with that of the Common Grey, the Silver Hull or the Japanese varieties has a decidedly yellowish tinge.

Varieties of Field Peas.

According to the reports of the Bureau of Industries for Ontario, we find that there were 304,491 acres used for the growing of field peas in the Province in 1911. This is the lowest acreage devoted to this crop of any one season in the last thirty years. It is about 100,000 acres less than in 1910, and only about one-half the average annual area used for pea growing in Ontario since 1882. The greatest amount of land used for pea growing in Ontario was in 1897, in which year no less than 896,735 acres were sown to this crop. The decrease in the acreage of field peas in Ontario is probably due to the ravages of the pea weevil (*Bruchus pisi*), and the unfavorable weather conditions for this crop in 1910, which lowered the yield to less than fifteen bushels per acre. The yield in 1911 was even lower than that of 1910, being only 14.7 bushels per acre throughout the province. The reduction in both the acreage and the yield per acre of the pea crop in Ontario is unfortunate, as this crop fills in such an important place in the agriculture of this province. The crop is exceptionally easy on the land and the grain is particularly rich in digestible protein which is so valuable in the improvement of the ordinary grain rations which are fed on the farm.

The following table gives the average results of twelve years' experiments with each of eight varieties of peas which have been under experiment:

Varieties.	Days to mature. Average 15 years.	Length of vines. Average 10 years.	Average results for 12 years.		
			Weight per measured bushel.	Straw per acre.	Grain per acre.
		Ins.	Lbs.	Tons.	Bus.
Early Britain	103	39	57.30	1.36	36.93
Potter	104	44	59.46	1.44	34.43
New Canadian Beauty	105	45	60.24	1.42	30.72
Black Eyed Marrowfat	106	42	59.56	1.43	30.41
White Eyed Marrowfat	106	41	60.65	1.48	29.27
Golden Vine	106	41	60.14	1.41	27.03
Prussian Blue	108	44	60.03	1.56	26.88
Multipliers	111	47	60.40	1.68	25.73

The results here presented show a marked difference in the comparative yields per acre of the eight varieties which have been under test for twelve years in succession. The Multipliers, a small white pea, has given an average of only 25.7, while the Early Britain, a large brown pea, has given an average of 36.9 bushels per acre. The New Canadian Beauty, which is now grown considerably throughout

the Province, and which is a large white variety, occupies third place, but has produced fully six bushels per acre less than the Early Britain variety. The Early Britain peas were imported from England by the Ontario Agricultural College twenty-three years ago and have made a good record, not only here at the College, but also in connection with the co-operative experiments throughout Ontario. Although the color of this variety of peas was thought to be somewhat objectionable from a market standpoint, it has not proven to be a serious obstacle, owing to the high quality of the peas themselves. The manager of the Split Pea Factory in Guelph considers the Early Britain variety one of the very best which he can use for the purpose, as the rich golden color of the split peas is attractive, and they are very salable. The Golden Vine variety, which comes third from the bottom of the list in yield per acre, is the common, small, white field pea of Ontario. The Potter variety of peas, which stands second in yield of grain is grown to only a very limited extent.

As eighteen varieties of peas have been under test for four years in succession at the College, the results are interesting as including a number of new kinds, the most of which were obtained through the kindness of the Department of Agriculture at Washington. The following table gives the average results of each of these varieties for a period of four years:

Varieties.	Average results for 4 years.		
	Weight per measured bushel.	Yield of straw per acre.	Yield of grain per acre.
	Lbs.	Tons.	Bus.
Early Britain	56.53	1.36	34.29
Clamart	57.89	1.21	33.41
Potter	58.99	1.42	32.86
No. 20467 (Wash.)	57.80	1.62	32.24
Black Eyed	59.30	1.56	31.84
No. 12887 (Wash.)	59.16	1.69	29.60
New Canadian Beauty	59.66	1.43	27.47
White Scimitar	56.16	1.13	26.93
No. 17006 (Wash.)	57.80	1.65	26.66
Early Sippinaw	59.15	1.30	26.25
No. 20466 (Wash.)	60.11	1.14	25.01
White Marrowfat	60.70	1.39	23.80
Swiss China	56.35	.69	22.19
Golden Vine	60.40	1.43	22.04
New Zealand Field	55.58	.94	21.30
Canner	57.74	1.00	20.72
Multipliers	60.18	1.43	18.87
Prussian Blue	59.86	1.45	18.66

In 1910, eleven varieties of field peas received from the Department of Agriculture were reported. As several of these varieties, however, had been imported from India and other eastern countries and had done very poorly in our experimental grounds, they were dropped from the experiment of 1911. In the last season, however, four of the Washington varieties were still continued in the experiment, one of them coming 4th, another 6th, another 9th, and another 11th in the lists in the average yield of grain per acre. It will be seen from the foregoing results that the Early Britain variety of peas has given the highest average

yield of grain per acre at the College in the four-year as well as in the twelve-year period. The Potter variety, which occupied second place in yield per acre in the results for twelve years, takes third place in the table for four years. This variety has been surpassed by the Clamart which is not included in the former experiment. The New Canadian Beauty, which was surpassed by the Early Britain variety by about six bushels per acre per annum in the twelve-years period, has been surpassed by that variety by about seven bushels per acre in the four-year period. The Golden Vine, the Multipliers, and the Prussian Blue all occupy comparatively low places in grain production in recent years.

Varieties of Field Beans.

Although ten varieties and nine separate selections of field beans were planted in the comparative test in the experimental grounds in 1911, the season was so unfavorable that the results are unsuitable for presentation in tabulated form. It might be mentioned, however, that the highest yield per acre was produced by a selection made at the College from the New Prize Winner variety. This selection was started from a single plant and is quite promising. Not only did it produce the largest yield per acre in 1911, but the beans weighed 66½ pounds per measured bushel, which weight was surpassed by no other variety.

Previous to 1911, each of eight varieties of beans were tested in the experimental plots at Guelph for a period of twelve years. In this experiment, the Pearce's Improved Tree bean gave an average of 25.1: Schofield Pea, 23.1: White Wonder, 22.4: Medium or Navy, 22.3: Burlingame Medium, 21.2: Marrowfat, 21.1: Small White Field, 18.9: and Large White Haricots, 17.8: bushels per acre. The beans of the Pearce's Improved Tree variety are medium in size, white and somewhat flattened in form. They are, however, nice, clear beans of good quality. We are now increasing the supply of this variety as it does not seem to be in general cultivation in Ontario.

In the experiments of the past four years previous to 1911, the Red Kidney, the New Prize Winner and the Yellow Eyed Marrowfat were included. These three varieties gave an average yield per acre in the order in which the names are given. None of them, however, surpassed the Pearce's Improved Tree bean in yield per acre in the average of the yields of all the varieties which have been under test.

Varieties of Soy Beans.

During recent years, a considerable interest has been taken in this crop in England, in the United States, and in Canada. The crop furnishes exceedingly rich feed for farm stock and the plants may be cut and converted into silage, or they may be allowed to ripen for the production of grain. Although there are a large number of varieties, the most of them require a long season to reach maturity and are quite unsuited for cultivation in Ontario. Fully thirty varieties have been under experiment at the College, but only a few of these ripened their seed.

In 1911, there were in all nine varieties and two selections of Soy beans under experiment at the College. Owing to the very unfavorable season, however, the results were comparatively low. The highest yields in pounds of grain per acre were produced by the Habara, 1005: Chernie, 961: and Buckshot, 675. We had one special selection, however, originated from a single plant of the Early Yellow Soy beans, which gave 738 pounds of grain per acre. This strain ripens very

well and is one of the most promising kinds of Soy beans which we have at the present time. The Early Yellow Soy bean, from which this selection was made, has proven to be one of the best in a series of experiments at the College when maturity and yield per acre are taken into consideration. The Early Yellow Soy bean has given an average yield of 14.5 bushels per acre for the sixteen years during which it has been grown.

Varieties of Flax Grown for Seed.

Although flax cultivation in Ontario is somewhat limited, there are certain sections of the Province which grow this crop both as a fibre plant and for seed production. In the western provinces, flax is grown considerably on land which is plowed in the spring for the first time.

In each of seven years, experiments have been conducted at College in the growing of flax from seed which was originally obtained from Ontario, Manitoba, Russia, and Holland. For the five years previous to 1910, each of the four varieties was sown by using six different quantities of seed per acre. In each of the past two years, however, only two quantities of seed per acre were used. The average results of the six plots of each lot of flax for each year previous to 1910, and of the two plots in each of the past two seasons are as follows:

Varieties.	Average Results for Seven Years.		
	Weight per measured bushel.	Yield of Straw per acre.	Yield of grain per acre.
	Lbs.	Tons.	Bushels.
Manitoba	53.87	2.51	17.55
Common	53.65	2.54	16.42
Russian	53.96	2.32	14.99
Holland	53.83	2.31	13.94

The Manitoba flax occupied the highest place in yield of seed per acre in the experiments of seven years. The seed of the Holland flax, although about equal to the rest in weight per bushel, was comparatively light in yield per acre. The straw of the Holland flax was also considerably less in yield than that obtained from Manitoba and the common variety.

The yields of flax per acre in 1911 were unusually light, owing to the exceedingly hot, dry weather. The average yield per acre of the duplicate experiments conducted in the past season were as follows: Common, 8.7 bus; Manitoba, 8.4 bus; Holland, 7.7 bus; and Russian 7.4 bus. Single plots of several selections made at the College from individual plants made a very fine appearance in the past season, but as the experiment was not conducted in duplicate, and as it has only been conducted for one season, no information of a very reliable character can be obtained until further experiments have been carried out. Some of the new selections have tall, upright plants, very attractive in appearance, and with indications of much promise.

Varieties of Millet for Seed Production.

Although millet is not grown very extensively as a regular farm crop in Ontario, it fills an important place in supplementing the hay crop when there is likely to

be a deficient supply of that product. As it will stand so much later sowing than many of the other crops and at the same time give satisfactory returns, millet is often sown at a time when it is feared that, owing to the peculiar weather conditions, the crop of timothy or of clover is likely to be less than usual.

In 1911, fifteen varieties and seven selections of millet were grown in the Experimental Department for seed production. The following table gives the average yield of seed per acre of seven varieties of millet which have been grown under uniform tests in each of the past eight years:

Varieties.	Average results for 8 years.	
	Weight per measured bushel.	Grain per acre.
	lbs.	bushels.
Siberian	53.9	**51.8**
Steel Trust	54.7	**48.2**
Hungarian	53.5	**44.8**
Holy Terror Gold Mine	50.5	**40.1**
German or Golden	53.4	**35.6**
Common	54.3	**34.8**
Golden Wonder	51.6	**34.4**

The Siberian variety of millet is certainly high in seed production, the average yield for the eight years being 51.8 bushels per acre. In comparison with this, the Common millet gave an average of only 34.8 bushels per acre or seventeen bushels per acre less than the Siberian variety. The Hungarian grass, which is so well known throughout Ontario, comes third in yield of seed per acre, but even this variety was surpassed by the Siberian by exactly seven bushels per acre. The Japanese Panicle and the Japanese Barnyard varieties of millet are both good producers of seed, but as these varieties ripen a little later than most other kinds, and as the small birds, especially the canaries, are exceedingly fond of the seed, it is difficult matter to so protect the plot that an accurate determination of the seed production of the plot can be made.

Of the new varieties grown in 1911 not included in the tabulated results here presented, the greatest yields were produced by the Kursk and the Canary Bird of the named varieties. One special selection of the Siberian somewhat surpassed the original strain of this variety in seed production. This has been true in each of four out of five years, during which time they have been tested under similar conditions.

Vetches for Seed Production.

The Common Spring vetches have been grown for seed production at the College, but it has been found that the yields are quite unsatisfactory. It is only in an occasional year that a fair yield of seed of the Common Spring vetches can be obtained in the College grounds.

Hairy vetches have been considerably advertised for use as a farm crop during recent years. They have been very highly spoken of as a cover crop for orchards and have also been recommended for fodder production. The seed, however, is nearly all imported from across the Atlantic and is very expensive, costing usually $5.00 or more per bushel, and for general purposes about one bushel of seed per acre is required. Along the southern part of Ontario, however, the Hairy Vetches have

been grown for seed production to a limited extent in recent years. In some seasons the seed production appears to be very good indeed and in other seasons it is comparatively light.

In experiments covering a period of ten years in which Hairy vetches were sown at the College in the autumn for the production of seed in the following year, an average of 7.9 bushels of seed per acre has been obtained. In three of these years the yield has been upwards of 18 bushels and in three other years, less than 2 bushels per acre. In 1911, the yield per acre was 18.4 bushels. The Hairy Vetches which have been grown at the College for several years, are producing about fifty per cent. greater yields of seed per acre than the Hairy vetches which have been more recently imported.

Sunflowers for Seed Production.

The growing of sunflowers has been highly recommended by a few individuals for the production of material for the silo, by using heads of the plants for mixing with the corn in the production of silage. Sunflowers have also been grown for the production of the seed, which is used considerably as a feed for poultry. Seven varieties of sunflowers were tested at the College for five years, after which all were discarded with the exception of three which have now been under experiment in each of the past fourteen years. The following table gives the average results of the size of the heads for eleven years, and the average height and yield of both heads and whole crop per acre for fourteen years, and the average yield of grain per acre for thirteen years:

Varieties.	Diameter of 25 heads. 11 years.	Average Height 14 years.	Average yield per acre.		
			Heads 14 years.	Whole crop. 14 years.	Grain. 13 years.
	Inches.	Inches.	tons.	tons.	bushels.
Mammoth Russian	7.33	101	6.01	18.50	76.61
White Beauty.....	7.48	89	5.69	17.07	74.09
Black Giant	7.22	107	6.42	22.85	73.23

Taking the standard weight of sunflower seeds as being twenty pounds per measured bushel, it will be seen that we have obtained a yield in the average of thirteen years of 76.6 bushels per acre of the Mammoth Russian variety. Although 1911 was a very severe year on many classes of farm crops, the Mammoth Russian sunflower gave a yield of seed per acre somewhat above the average. It will be seen that the sunflowers have given heavy yields of seed per acre at the College. They are a very hardy crop and would likely be comparatively heavy yielders in different parts of the province. For this experiment, seed was planted about the same as corn.

Varieties of Sorghum for Seed.

The sorghums are represented by several groups of plants which are used more or less for fodder as well as for other purposes, and include the different varieties of sugar cane, broom corn, kaffir corn, millo maize, etc. Not only is there a marked difference in the different classes of sorghums but there are also great

differences in the varieties in each of the classes, especially in the first two here named. Eleven different varieties of sorghums were under experiment in 1911 for seed production. Of these varieties, the yield of seed was very light with one exception. The Early Amber sugar cane surpassed all others in yield of seed per acre during the past season, the yield being slightly over 30 bushels.

As we have nine years' experience in growing some of the varieties of sorghum for seed production, it is interesting to know that the greatest average yields per acre have been obtained from three varieties of broom corn; viz., Early Japanese, 22.4; Improved Evergreen, 21.1; and California Golden, 20.6. The broom corns, however, when grown in general cultivation, are cultivated with the object of securing the heads of the plants for the manufacture of brooms and whisks rather than the production of fodder for farm stock. The sugar canes, however, are grown in increasing quantities in some sections of Ontario for the production of pasture, green and dry fodder, and seed. The sorghums seem particularly suited to warm, rich, sandy loams. The sorghums are sown and cultivated in a somewhat similar manner to corn, but the rows are usually placed rather closer together. Further reference will be made to the sorghums in a later part of this report where they are discussed more particularly from a fodder standpoint.

Varieties of Corn for Grain Production.

In 1911, those counties of Ontario which had the greatest number of acres in corn for the production of the grain were as follows: Essex, 74,895; Kent, 63,977; Brant, 48,566; Lambton, 23,427; Elgin, 22,317; Norfolk, 16,960; Middlesex, 16,255; Prince Edward, 7,649; Welland, 7,404 and Oxford, 6,960. According to the reports of the Bureau of Industries, the yields in bushels per acre varied from 28 in Thunder Bay and 30 in Algoma to 82.2 in Elgin and 79.2 in Essex. While it is probable that the yield of corn per acre in the northern districts of Ontario will usually be less than those in Southern Ontario, especially in the most favored districts for corn growing, yet it is surprising what can be done in corn growing in those districts where it was previously thought that corn would give practically no returns. There are now so many varieties that, by a proper selection to secure those kinds that are the most suited for growth in the different sections, rather surprising results are frequently obtained. When in Newfoundland three years ago last spring, I was informed that no grain had ever been matured in the Colony, and when they were told that it was believed to be possible for corn to ripen in the vicinity of St. John's, the people were surprised. A small quantity of seed of the earliest corn which we have ever grown was soon afterwards forwarded to Newfoundland, and a well ripened ear was received in return in the autumn with a copy of a Newfoundland agricultural journal which contained an article in regard to the growing and maturing of Indian corn, even in that country.

In 1911, seventy-four varieties of corn were grown in the Experimental Department. A number of these, however, did not mature the grain thoroughly and had to be judged entirely from the standpoint of fodder production. For the report on the different varieties of corn based on fodder alone, the reader is referred to a later section of this report. Thirteen varieties of corn have been grown for grain production at the College in each of the last five years. The average results of the five year period are here presented for each of these varieties.

Varieties.	Color of Grain.	Average Number of Rows per ear.	Average results for 5 years.			
			Number of Days until in full Tassel.	Height of Plants.	Weight of freshly cut Stalks and Leaves.	Shelled Grain per Acre.
				Inches.	Tons.	Bushels.
Early California Flint	Yellow	12	81	91	11.05	59.7
Wisconsin Little Dent	Yellow	14	76	89	6.82	54.6
Early White Cap Yellow Dent	Yellow	14	82	99	10.69	50.5
Wessel	Yellow	8	81	95	11.02	49.9
University No. 13	Yellow	16	81	97	9.85	49.8
Compton's Early	Yellow	12	84	100	13.20	46.1
Longfellow	Yellow	8	81	93	12.42	45.8
Genesee Valley	Yellow	8	81	90	11.91	45.0
Red Blazed	Red Yellow	8	81	94	11.13	44.6
Canada Yellow	Yellow	8	84	89	12.21	41.4
Sterling White Dent	White	14	84	97	10.79	35.9
Salzer's North Dakota	White	8	90	97	15.35	34.7

The Early California Flint corn occupies the highest place in yield of grain per acre, surpassing the Wisconsin Little Dent by an average of fully five bushels per acre per annum. The Early California Flint is a twelve-rowed yellow grained variety which gives a fairly good total yield per acre as well as a high yield of the shelled grain. It will be seen that, although it resembles the Compton's Early in color of the grain and the number of rows in the ear, it is three days earlier and yields over two tons of total crop per acre less, but fully thirteen bushels of shelled grain per acre more. It therefore might be looked upon as an improved early strain of the Compton's Early variety. The Salzer's North Dakota, although at the bottom of the list in yield of grain per acre, has given a greater total yield than any of the other varieties included in the list. It will be seen that the Wisconsin Little Dent, although a comparatively high yielder of grain, is a very small producer of stalk and leaf. The Early White Cap Yellow Dent included in this experiment, is the earliest strain of that variety which has been tested at the College. It is sometimes known and reported on as the Hammond strain of the White Cap Yellow Dent.

Comparison of Strains Within the Varieties.

We have placed a considerable amount of stress on the importance of securing the best varieties of corn for the different localities in Ontario, whether the main object be the securing of shelled grain or of green or dry fodder, or of the cured product in the form of silage. We have also drawn attention in more than one instance to the comparisons of different strains of corn in the same variety. We believe this subject of sufficient importance to give it special consideration in this section of the report. In many cases, farmers located in different parts of the country have been growing corn for a number of years and have been selecting the ears according to their own ideals, some with the object of producing heavy crops, others with the hope of securing earlier strains, etc. Owing to the various conditions under which these different lots of corn have been selected and grown, there becomes, in time, a considerable difference in the distinct strains of the same variety. In order to glean information regarding the influence of these various selections on the

variety itself, seed of the White Cap Yellow Dent corn was obtained from eight different farmers in the western part of Ontario. Owing to different causes, it has been impossible to secure seed regularly from all of these men each year. In three instances, we have been able to secure seed from the same source in each of the past six years. The seed thus obtained has been planted under uniform conditions each season, and the crops have been carefully examined. The following table gives the average results of six years' experiments in testing the White Cap Yellow Dent corn obtained from three different sources, two from Essex County, and one from Middlesex County:

Varieties.	Average results for 6 years.			
	Number of days until in full Tassel.	Height of plants.	Weight of freshly cut stalks and leaves.	Yield of grain per acre.
		Inches.	Tons.	Bushels.
White Cap Yellow Dent. (J. Hammond)	81	99	10.21	56.37
White Cap Yellow Dent. (E. M. Zavitz)	84	106	11.64	52.37
White Cap Yellow Dent. (A. Dawson)	86	109	12.73	43.87

It will seen by a study of the results presented that there are marked differences in the three strains of the White Cap Yellow Dent corn which have been under test. The strain obtained from Hammond was five days earlier than the Dawson strain in reaching full tassel. In average height of plants, the Dawson strain was exactly ten inches taller than the Hammond strain. In weight of the freshly cut stalks and leaves, the Dawson corn gave fully two and one-half tons per acre more than the Hammond strain, but the latter surpassed the former by almost thirteen bushels of shelled grain per acre. It will therefore be seen from the results of this experiment that Mr. Hammond has selected early maturing corns which thoroughly ripen and produce a large yield of grain, while Mr. Dawson has selected corn which is much larger in the plants, and which is much later in reaching maturity. The White Cap Yellow Dent selected by Zavitz in Middlesex County occupies an intermediate position throughout. From what has been stated and from a study of the results presented in this report, it will be clearly seen that a variety of corn grown for some time by different men who have probably been selecting their seed from a somewhat different standpoint, will eventually produce strains which vary considerably. It is therefore important for farmers when securing seed corn from any one source which they find to be satisfactory, to be careful and secure the same strain from one year to another, as a change in the strain might make a considerable difference in the crop produced.

The results of the experiments to which we have just referred, have been different strains of the same variety of corn grown by different men on neighboring farms or in neighboring counties. The source of the seed has been known in every case. We sometimes, however, obtain corn from seedsmen, the source of which is entirely unknown. The seed may have been produced in one of the counties of Ontario or it may have been produced in some of the states of the American Union considerably to the south of Ontario. I here draw the attention of the reader to the results of two lots of the Longfellow variety of corn obtained regularly from

two different sources. One lot has been obtained from J. O. Duke, Ruthven, and the other from the Steele Briggs Seed Co., Toronto, Ont. It is quite probable that in each, the seed obtained from Duke was produced in Essex County and that obtained from the Steele Briggs Co., was imported from the United States. Whatever the source of supply, the results obtained from the two varieties have been quite different. The following table gives the average results of these two lots of Longfellow corn for each of seven years:

Varieties.	Average Results for Seven Years.			Yield of Grain per Acre. Bushels by Weight.							
	No. of days until in full tassel.	Height of plants.	Weight of freshly cut stalks and leaves.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	Average seven years.
		Inches.	Tons.								
Longfellow (Duke)	81	95	12.18	71.9	84.9	51.8	61.2	36.9	47.3	31.8	**55.1**
Longfellow (Steele Briggs)	87	96	13.91	52.0	79.0	33.9	55.8	27.4	34.5	30.7	**44.8**

The Longfellow variety of corn has, in the average of seven years, been six days earlier in coming into tassel than the corn obtained from the Steele Briggs Co. The latter named strain of corn has grown to a height of one inch in excess of that of the other. The Longfellow corn obtained from Steele Briggs gave an annual yield per acre of 1.7 tons of total crop more and of 10.3 bushels per acre less than the Duke strain of Longfellow corn. It will therefore be seen that these two strains are quite different; one being much smaller and earlier than the other variety, but being a heavier producer of grain under the condition of experiments at Guelph. These results, as well as those presented previously, show the great importance of the farmers having some knowledge, not only of the varieties of corn, but also of the source under which the seed has been grown.

Varieties of Potatoes.

Owing to the peculiar and unfavorable weather conditions throughout Ontario during the past year, the average yield of potatoes per acre in this Province was only 86 bushels in comparison with 130 for 1910, 145 for 1909, and 115 for the average of the past thirty years. The lowest yields of potatoes per acre within the last thirty years were as follows: 1887, 76.1 bus.; 1892 and 1898, 84 bus.; 1902, 89 bus.; 1893, 91 bus.; and 1897, 95 bus. It will therefore be seen that in the past thirty years the yield per acre was less than that of 1911 in only three instances, viz., 1887, 1892 and 1898. The highest yields which have been produced within the past thirty years were those of 1884, 163.2 bus.; 1895, 159 bus.; 1891, 150 bus.; and 1909, 145 bus. It will therefore be seen that in the past three years we have had one of the best and one of the poorest seasons for potato growing in Ontario. It is interesting to note that the average yield of potatoes per acre in Ontario in 1911 varies considerably. Those counties which produced the lowest yields per acre during the past year were Glengarry, 42 bus.; Lennox and Addington, 46 bus.; Carleton, 48 bus.; and Prince Edward, 49 bus.; and those counties and districts which gave the highest yields per acre were Rainy River and Kenora,

194 bus.: Thunder Bay, 170 bus.: Algoma, 148 bus.: Huron, 144 bus.: Dufferin, 129 bus.: Perth, 128 bus.: Haliburton, 125 bus.: Sudbury, 123 bus.: and Wellington, 121 bus. It will therefore be seen that some of the poorest yields of potatoes per acre in 1911 were in the eastern part of the Province and the highest yields per acre were in the Northern and newer sections. In number of acres used for the potato crop during the past year, Simcoe County stands first with 8,859 acres, York second with 7,461 acres, Carleton third with 6,426 acres, Middlesex fourth with 6,265 acres, and Grey fifth with 6,153 acres. In comparison with these, there were five counties and districts in Ontario which had less than one thousand acres each, which were as follows: Rainy River and Kenora, 597 acres; Manitoulin, 651 acres; Haliburton, 881 acres; Sudbury, 952 acres; and Thunder Bay, 998 acres. The total number of acres in potatoes in Ontario in 1911 was 162,457; in 1910, 168,454; and in the average of the past thirty years, 157,664.

Although the number of acres of potatoes in Ontario in 1911 was a little lower and the average yield per acre decidedly lower than the average, the potato growers will probably realize as much money for their potatoes this year as they have in some of the other years in which the crop was much greater, as the prices are considerably in advance of those of some of the other seasons. We believe that there is an excellent opportunity for a considerable development in potato growing in Ontario to the advantage of the farmers. In order, however, to get the highest results, the best varieties should be obtained and the best methods of cultivation should be adopted. There are far too many varieties of potatoes grown in Ontario at the present time. If a few of the very best varieties were selected and grown more extensively, the yield per acre would be increased and the prices obtained would be higher. In many localities, it is practically impossible to secure large quantities of potatoes which are uniform in shape and color, and which could be satisfactorily placed together for shipping to our larger markets. From inquiries made throughout Ontario, the following appear to be some of the most extensively grown varieties in the Province at the present time: Rural New Yorker No. 2, Empire State, Carman No. 1, Beauty of Hebron, Delaware, White Elephant, and Early Ohio. The Rural New Yorker No. 2, a white, round potato, and the Empire State, a white, oval shaped potato appear to be the most extensively grown varieties in the Province at the present time.

Ninety-five varieties of potatoes were grown in the experimental grounds at the College in 1911. Of this number, fifty-seven varieties have been grown in each of the past five years. In the average results of the five year tests, the Davies' Warrior heads the list with 239.4 bushels per acre. This is followed by the Howard, 239.2 bushels per acre: and the Beauty of Hebron, 220.5 bus. per acre. The Davies' Warrior variety of potatoes was obtained soon after its introduction in Scotland, from which country a small quantity of seed was secured. It is a large, white potato, comparatively shallow in the eyes and rather late in reaching maturity. It somewhat resembles in appearance the Carman No. 1 variety. The table quality of the Davies' Warrior is good when the flavor, mealiness and appearance are all taken into consideration. The Empire State has made an exceptionally fine record at the College over a long series of years. It has also given high results throughout Ontario in connection with the co-operative experiments. The Empire State is not only a heavy yielder, but the potatoes are large and uniform, of good table quality, and of excellent appearance as a market variety. The Empire State is a finer grained potato than the Rural New Yorker No. 2, and when the latter named variety is grown on sharp, warm soil, the quality is usually good, but

when grown on rich, loamy land the potatoes are apt to be large, coarse and somewhat hollow. Of the very early potatoes, the Early Eureka has proven to be one of the best both at the College and in the co-operative experiments. It is a white potato, somewhat roundish in form, and usually of good size. If the farmers of Ontario were growing mostly such varieties as the Empire State, the Rural New Yorker No. 2, and the Davies' Warrior of the late varieties; and the Early Eureka for early use, there would likely be a considerable increase in average yield per acre, in average quality of the potatoes, and in the average price per bushel which would be realized when the potatoes were sold.

Potatoes Obtained From Different Sources.

In 1910, and again in 1911, an interesting experiment was conducted in testing seed potatoes obtained from different sources. Seed of the Empire State variety, for instance, was obtained from Muskoka and from two sources in New Brunswick in each of six years. These three lots of potatoes were compared with seed of the Empire State variety which had been grown at the College without a change of seed from any outside source for twenty-one and twenty-two years. The experiment was conducted in duplicate each year. In 1910, the Empire State which had been grown in the College plots for twenty-one years, produced a higher yield of potatoes per acre than the seed obtained from any of the other sources used in each of the two tests. In 1911, however, the seed from the outside sources gave higher yields per acre than the Empire State which had been grown at the College continuously for twenty-two years. The seed of the Empire State, obtained from Muskoka in the spring of the present year, gave higher results than that obtained from either one of the two sections of New Brunswick. It is expected that this experiment will be continued for several years until some good average results and interesting and important information can be secured.

The Preparation of Seed Potatoes for Planting.

A large number of experiments have been conducted in the trial grounds at Guelph in preparing seed potatoes and in planting the seed thus prepared in different ways. The results which have been conducted in the past, go to show that for average conditions it is wise to select good sized potatoes of good shape and form, to cut the potatoes into pieces varying in size from one to two ounces, and having 2, 3, or 4 eyes in each set. As soon as the potatoes are cut they should be dropped into land plaster or gypsum, so that the material could adhere to the moistened portions of the potato sets. These sets should be planted immediately after they are cut and coated with land plaster. On the average clay loam in the College experimental grounds, it has been found advisable to plant the potato sets to a depth of about four inches in rows about twenty-eight inches apart, and with the sets from twelve to fifteen inches apart in the rows. There has been practically no difference in yield of potatoes per acre from level and from hilled cultivation, as the result of experiments over a series of ten years. In the wet seasons, the hills would give the best results, and in the dry seasons the highest results have been obtained from level cultivation.

Bordeaux Mixture for the Potato Blight.

In each of the past five years early, medium, and late potatoes have been sprayed in different ways with two different solutions of the Bordeaux mixture. In

reference to these two solutions, the following quotations are made from the College Bulletin No. 154:

"The first thing to do in the manufacture of the Bordeaux mixture is to decide on some recommended formula. The formula which has long been advocated in Ontario is known as the 4—4—40 formula. It is as follows:—

$CuSO_4$ (crystallized copper sulphate)	4 pounds
CaO (quicklime)	4 "
Water	40 gallons.

"With good lime, it only needs about one pound to act on all the copper; the excess given, three pounds, covers all danger which might arise from the use of a poor article. A large excess of lime is a disadvantage; it causes the Bordeaux mixture to exert a slow fungicidal action, it is apt to cause the machinery to clog and to cause an uneven application, and the particles of lime, offering more resistance to rain, will cause the mixture to be more rapidly washed from the trees. It may be an advantage, however, in a very wet season, by causing the Bordeaux to retain its efficiency longer and by allowing less injury to be done to foliage. Orchardists are inclined to use a less proportion of lime, and the following formula is recommended:—

$CuSO_4$ (crystallized copper sulphate)	6 pounds
CaO (quicklime)	4 "
Water	40 gallons.

"As both copper sulphate and lime dissolve and slake, respectively, much quicker in hot water than cold, it is better to use heated water, in order to save time. The very best lime obtainable is used, and if freshly burned, all the better. In slaking, do not use an excess of water, but just enough to keep the lime moist. When the action is completed, enough water is added to make a thin whitewash, and then the whole is strained through coarse sacking, to remove any lumps which would clog the nozzle of the spray pump. This done, enough water is added to make the volume up to one-half of what the final mixture will amount to. The copper sulphate solution is diluted to the same extent. The two are now mixed, the operation being best performed by two men, each with a bucket, one handling the lime and the other the copper sulphate. They are poured into the spray tank, two bucketsful at a time, until the whole is brought together. In this way, a precipitate is obtained which will remain in suspension with only occasional agitation. If mixing is done before dilution, a very coarse precipitate is formed, which settles rapidly to the bottom of the spray tank and requires almost constant stirring.

"If large quantities of spray mixture are going to be used, it is an excellent plan to make up "stock" solutions of the copper and lime. This can be done by dissolving say, one pound of copper sulphate in each gallon of water and making up a barrel full of it. Each gallon of the solution taken, then, represents one pound of the bluestone. The salt can be conveniently dissolved by filling the barrel with water and then suspending it therein, enclosed in a canvas sack. The lime can be handled in the same way, being sure, of course, that the contents of the barrel are thoroughly stirred up before dipping out any portion. Keep the barrels covered when not in use.

"Before Bordeaux mixture is sprayed, it is absolutely necessary that all copper should be in the form of the sky-blue precipitate, *i.e.*, enough lime must be used to act on all the bluestone. Formulæ advocated by the experiment stations always contain enough lime to precipitate all the copper, but it may sometimes happen that such a very poor quality is used that there will be some of the sulphate left unchanged. There are several simple ways by which one can tell when enough lime is present. Those who are very familiar with the reaction which occurs, can tell by the colour of the precipitate, it having a greenish tinge when an insufficiency of lime is present, instead of the deep, sky-blue colour. However, those who are not familiar with the process must use more decided tests. Three simple ones can be employed, as follows:—

"1. Take some of the clear solution, which is left on top when the sediment settles, and place in a white saucer. Add a few drops of a solution of potassium ferrocyanide to it. If a reddish-brown precipitate or coloration appears, more lime is needed.

"2. Take a portion of the clear fluid as before, and blow the breath gently over the surface. If a thin white pellicle or covering forms over the top, enough lime has been added.

"3. Take a bright piece of steel, such as a knife blade, and hold it in the mixture for a minute or more. If it becomes coated with copper, more lime is required.

"Test number one is the most reliable, and is the one recommended.

"In handling copper solutions, use only wooden, brass or copper vessels; all other receptacles would be corroded and destroyed by them; besides, the fungicide itself would be injured.

"Copper compounds are poisonous, and, therefore, should not be left lying around where children and animals can get at them."

Spraying experimental potatoes.

In the experiments of the past five years, one plot of each variety of potatoes was left unsprayed, one plot was sprayed on top of the vines two times; one, three times; one, four times; one, five times; and one six times. Another plot was sprayed three times both on top and underneath the vines. In the results for 1911, the lowest yields per acre were obtained from the unsprayed plot and from a plot which was sprayed on top of the vines only three times, and the highest yield per acre was obtained from the plots which were sprayed three times both on top and underneath the vines. In the average results of all the experiments, the highest average yield has been obtained from spraying three times on top and underneath the vines. This treatment has given larger yields per acre than when the potatoes were sprayed either five or six times on top of the vines. The work of spraying potatoes on both the tops and underneath the vines has been a difficult matter to perform until the sprayers were made which would do this work with a considerable amount of satisfaction. We are now enabled to spray the vines both on top and underneath at the same time, and treatment can be given to four rows at the one operation by the use of a one-horse spraying machine.

Other Potato Experiments.

A number of other experiments with potatoes: such as, the influence of the maturity of seed on crop production, the use of commercial and home-made lead arsenate compounds for the treatment of the potato beetles, the use of different applications for the treatment of scab, the applications of various commercial fertilizers and manures for crop productions are under way and will be reported on in due time.

The Growing of Root Seed in Ontario.

About 200,000 acres were used in the growing of mangels, sugar beets, turnips and carrots in 1911. About one-half of this area was used for turnip growing and the rest for the three classes of roots here mentioned. The area devoted to carrots, however, has been decreasing from year to year until 1911, when only about 3,000 acres were used for this crop.

Practically all of the seed of the different root crops is imported from Europe, the main sources being from Germany, France, and England. During the last five years, we have carried on systematic work in the growing of seed of mangels, swede turnips, and carrots, and have been testing the seed so produced with seed of similar varieties which has been imported. In the autumn of each of the past six years, roots were selected and stored during the winter and were planted in the spring. Some of each class of roots were pitted in the fall, some were stored in piles in the root cellar, and some were placed in sand. We have, however, found it difficult to pit a small quantity of roots and have the roots under the same conditions as those which have been pitted in large quantities. In the other methods of storing, we have found that we could obtain practically as good results when the roots were stored in the loose piles in a cool cellar as when they were packed in sand. During the past three years, we have obtained very good results from the home-grown root seed, especially in the case of mangels. The results of some of the experiments with home-grown seed will be presented along with the tests of the different varieties of roots.

Varieties of Mangels.

Forty-two different lots of mangels were sown in the Experimental department in 1911. Of this number, six were different lots of the Yellow Leviathan, the seed of which was grown at the College, and seven were different lots obtained under the name of Yellow Leviathan from seven Ontario seedsmen who advertised this variety in their seed catalogues. The others were varieties obtained from various seedsmen in Ontario, United States, and from some of the most noted producers of mangel seed of Europe. All of these different lots of mangels were sown in duplicate plots in the experimental grounds and some of them were under test in four different places. The main part of the experiment consisted of three rows which were three and one-half links apart and four rods in length, thus making exactly 1-100 of an acre in each plot. The seed was planted with great care by placing exactly four clusters of seed every ten inches in the row. There would therefore be 948 mangel clusters, usually called seeds, planted in each plot. At a little later date a duplicate test was made by planting in exactly the same way one row of each variety, each row being four rods in length. These two different sets gave a good opportunity for studying the germination of the mangel seeds under field conditions as they occured in the present year. This experiment was conducted in a very similar way in 1910 and in 1909, except that there were four instead of two tests made with the different varieties in 1909. The germination of the seed in 1909 was exceptionally poor and that of 1910 and 1911 was, on the whole, rather better except in individual cases. The results here presented, therefore, give the average percentage germination for the three years, which include eight separate tests.

Varieties.	Shape.	Percentage of germination av'rage 3 years, 1909-1911. (3 tests.)
Steiger's Yellow Leutewitzer	Globe	145
Bruce's Gate Post Mammoth Long Red	Long	138
Giant Eckendorf (Vaughan)	Tankard	136
Von Arnims Criewener	Tankard	134
Steele Briggs' Prize Mammoth Long Red	Long	128
Yellow Leviathan (O.A.C)	Intermediate	123
Kirsche's Ideal	Tankard	120
Carter's Red Emperor	Intermediate	118
Garton's Improved Yellow Globe	Globe	112
Simmers' Mammoth Prize Long Red	Long	110
Sutton's Mammoth Long Red	Long	109
Steele Briggs' Giant Yellow Intermediate	Intermediate	105
Yellow Leviathan (Ferry)	Intermediate	105
Yellow Leviathan (Hewer)	Intermediate	102
Rennie's Perfection Mammoth Long Red	Long	102
Carter's Windsor Prize Taker Yellow Globe	Globe	101
Yellow Leviathan (Steele Briggs)	Intermediate	99
Sutton's Prize Winner Yellow Globe	Globe	99
Keith's Prize Taker	Globe	96
Mammoth Red Intermediate (Bruce)	Intermediate	83
Yellow Leviathan (Rennie)	Intermediate	62
Yellow Globe Selected (Steele Briggs)	Globe	48

Yellow Leviathan Mangels from seed produced at the College.

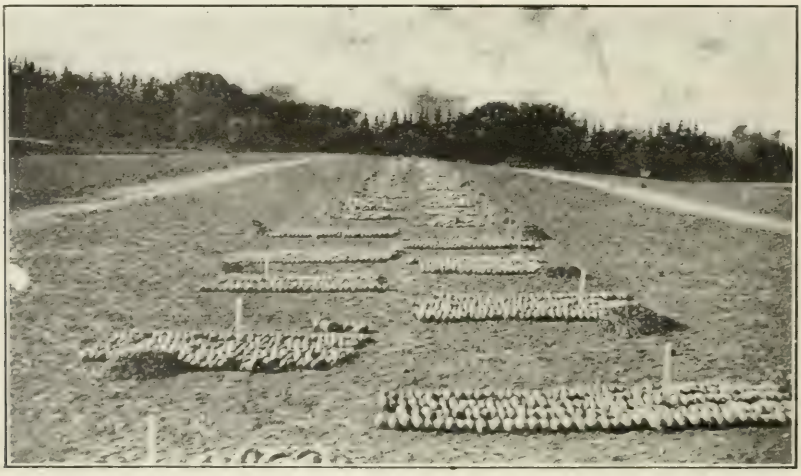
The variety which gave the highest percentage of germination in the average results for the three years was imported directly from Germany. The Yellow Leviathan seed grown at the College occupies sixth place in percentage of seed germination, the average being 123 per cent. In comparison with this, we find the average germination of the seed of the Yellow Leviathan obtained from D. M. Ferry, Windsor, to be 105; from Jas. Hewer, Guelph, 102; from The Steele Briggs Seed Co., Toronto, 99; and from the Wm. Rennie Seed Co., Toronto, 62. Different lots of seed of the Yellow Leviathan variety obtained from D. M. Ferry in the spring of

1911 have varied considerably in their percentage of germination, some being very good and others comparatively poor. The seed of the Yellow Leviathan mangel obtained from the Wm. Rennie Seed Co., Toronto, has given the lowest germination of the different lots of Yellow Leviathan seed obtained from different seedsmen in each of the past three years. In 1910, seed under the name of Yellow Leviathan, obtained from J. A. Simmers, Toronto, and Jno. A. Bruce, Hamilton; and in 1911, from J. A. Simmers, Toronto, Jno. A. Bruce, Hamilton, Geo. Keith, Toronto, and Jas Hewer, Guelph, produced roots of different types from the type of Yellow Leviathan which had given such good results in our experimental work at Guelph within the past ten years.

Of the different lots of Yellow Leviathan seed sown in 1911, the highest yield per acre was obtained from that grown at the College, and the second highest yield per acre from that obtained from The Steele Briggs Seed Co., Toronto. In 1910, the highest yield of Yellow Leviathan mangels was obtained from the seed purchased from D. M. Ferry, Windsor, Ont., and in 1909, from the seed grown in the experimental grounds at the College.

A number of varieties of mangels have been grown in the College plots under uniform conditions in each of the past five years. The following table gives the average results for the five-year period of each of the twelve varieties grown:

Varieties.	Weight per root.	Yield of Tops per acre.	Yield of roots per acre.
	lbs.	tons.	tons.
Giant Eckendorf (Vaughan)	2.82	3.11	**30.68**
Yellow Leviathan (Ferry)	2.80	5.16	**30.37**
Rennie's Perfection Mammoth Long Red	2.69	5.10	**29.77**
Sutton's Prize Winner Yellow Globe	2.65	2.23	**29.70**
Ideal (Kirsche)	2.56	3.05	**29.69**
Garton's Improved Yellow Globe	2.65	2.13	**29.63**
Sutton's Mammoth Long Red	2.69	5.16	**29.53**
Carter's Windsor Prize Taker Yellow Globe	2.55	2.40	**28.92**
Simmer's Mammoth Prize Long Red	2.51	4.63	**27.66**
Steele Brigg's Giant Yellow Intermediate	2.44	3.84	**27.29**
Carter's Red Emperor	2.40	3.02	**27.22**
Mammoth Red Intermediate (Bruce)	2.30	2.90	**26.06**



Varieties of Mangels, with different strains of the Yellow Leviathan classified into rows according to shape, color, etc.

The Giant Eckendorf, which stands the highest in yield per acre of the mangels grown for a period of five years, is a tankard variety. This is followed very closely by the Yellow Leviathan of the D. M. Ferry strain. It will be seen that the highest yielding long red mangel in the list is surpassed in yield per acre by two other types of mangels, viz., the tankard and the intermediate. The Sutton's Mammoth Long Red has not given quite as high results comparatively as it did a few years ago, although the difference in yield per acre between the highest seven varieties is not much more than one ton per acre.

An interesting experiment with mangels and fertilizers was started in the spring of 1911, but as only one year's records have been secured, the detailed results will not be presented. It might be stated, however, that the returns from the nitrate of soda with the mangel crop have been quite promising both in the experiments at the College and in the co-operative tests over Ontario. From 100 to 160 pounds of nitrate of soda per acre applied broadcast to the land at the time of sowing the mangel seed has increased the yield per acre about five or six tons.

Students examining the varieties of Mangels.

Varieties of Sugar Beets.

There are two types of sugar beets grown in Ontario, one for the purpose of manufacturing into sugar and the other to furnish roots for feeding purposes. Those varieties of sugar beets grown for sugar production are usually rather smaller in size, and grow almost entirely under the ground, while those which are grown as a farm crop are larger in size and are much easier handled as they grow out of the ground somewhat similar to mangels. Those varieties of sugar beets which have been bred extensively for sugar production usually give about 15 per cent. of sugar when grown in this country, while those which are raised more particularly for stock feed will contain, on an average, only about 9 or 10 per cent. of the sugar.

Twenty varieties of sugar beets were grown at the College in 1911. All the varieties were grown in rows twenty-one inches apart, and the roots were thinned to seven inches apart in the rows. The following table gives the average results in tons of roots per acre and also the percentage of sugar of nearly all of the varieties as determined in the Chemical Department at the College:

Varieties.	Length.		Percentage Sugar.	Yield per acre. 5 years.
	Above ground.	Below ground.		
	inches.	inches.		tons.
Rennie's Jumbo	3.85	4.80	....	24.8
Bruce's Giant White Feeding	3.72	5.10	8.1	24.2
Giant Half Sugar White	3.62	4.86	....	23.1
Steele Brigg's Giant White	3.61	5.18	....	22.8
Tankard Cream	3.39	4.68	8.6	22.1
Bruce's Giant Rose Feeding	3.33	5.28	13.0	20.5
Simmer's Imperial Giant Half Sugar	3.09	5.29	10.6	20.5
Rennie's Giant Sugar	3.20	5.27	10.3	20.2
Royal Giant	3.07	4.96	10.2	19.6
Rennie's Danish Improved	3.14	5.09	11.1	19.4
Improved Imperial	1.14	5.76	16.8	15.1
White Silesian	.83	6.12	13.7	15.1

In the average results of five years' experiments, the Rennie's Jumbo occupies highest place in the yield of roots per acre. Unfortunately, however, this variety was not grown when the sugar determinations were made in the chemical laboratory. We are unable to give the sugar content of the varieties which stand 1st, 3rd, and 5th in the list. Of all the varieties grown in 1911, the greatest yields per acre were produced by the Tankard Cream, 27.3 tons; Bruce's Giant White Feeding, 26.6 tons; and Giant Half Sugar White, 21.4 tons.

Varieties of Swede Turnips.

About 100,000 acres of turnips were grown in Ontario in 1911. In the experiments with turnips at Guelph, the returns for 1907 and 1908 were exceedingly poor. The results for five out of the last seven years have been more satisfactory. The following table gives the average results for the five years 1905, 1906, 1909, 1910, and 1911 in weight per root, yield of tops per acre, and yield of roots per acre:

Varieties.	Weight per root.	Yield of tops per acre.	Yield of roots per acre.
	lbs.	tons.	tons.
Keepwell (Garton)	1.78	8.88	20.22
Carter's Prize Winner	1.69	8.91	19.50
Carter's Invicta	1.72	9.39	19.17
Good Luck	1.67	8.90	19.08
Defiance	1.62	8.29	18.56
Improved Purple Top Yellow	1.60	8.20	18.44
Sutton's Queen	1.62	5.85	18.13
Cropwell	1.73	7.54	18.05
Empress	1.62	7.83	17.89
Improved Hall's Westbury	1.54	8.55	17.65
New Century	1.57	7.92	17.41
Sutton's Magnum Bonum	1.51	8.92	16.82
Hartley's Bronze Top	1.45	8.48	16.42
Kangaroo	1.40	8.22	15.79

The Carter's Invicta, which occupied highest place in average yield per acre last year, now occupies third place in this respect. The Keepwell, a new variety, the seed of which was imported from England and which this year comes into the list of varieties for five years for the first time, occupies the highest place in productiveness, the average being a little over twenty tons per acre. The Hall's Westbury, a noted old variety, occupies 10th place in average yield of roots. The Carter's Invicta, which comes 3rd in the list, is not only a large yielder per acre but it has been pronounced by men who are engaged in the shipping of turnips for table use to some of the Eastern cities; such as New York, Philadelphia, and Boston, to be an excellent variety for that purpose.

Varieties of Fall Turnips.

The class of roots known as fall turnips do not keep late into the winter. This class of roots also goes under the names of soft turnips and white turnips. The fall turnips are grown to only a limited extent throughout the Province. The yields are usually large, generally surpassing those of the varieties belonging to the class known as Swede turnips. Twelve varieties of fall turnips were grown under experiment in 1911. The greatest yields per acre were produced by the Red Top White Globe, 37.3 tons; Sutton's Purple Top Mammoth, 30.6 tons; Cow Horn, 28.5 tons; Sutton's Imperial Green Globe, 28.1 tons; and Fynsk-Bortfelder, 26.3 tons. Two varieties of fall turnips have been grown in each of ten years, and for that period of time the Red Top White Globe has given an average of 27.6 and the Cow Horn of 20.6 tons per acre.

Varieties of Field Carrots.

Field carrots are not grown as extensively in Ontario at the present time as they were a few years ago. It is probable that the introduction of sugar beets as a feed for farm stock has, to a certain extent, taken the place of the field carrots. Only slightly over 3,000 acres of carrots were grown in the Province in the past year. The following table gives the average of six years' results with each of six varieties of carrots grown in the experimental grounds at the College:

Varieties.	Color.	Length of roots.	Yield per acre.
		inches.	tons.
Steele's Improved Short White	White	8.5	28.0
Mammoth Intermediate Smooth White	"	8.3	27.5
Mastadon White Intermediate	"	8.6	27.4
Simmer's Improved Giant Short White	"	8.7	27.2
Large White Belgian	"	11.1	22.9
Carter's Gate Post Orange Long	Yellow	8.9	21.4

It will be seen that the yields of carrots in Ontario are still quite high. The Steele's Improved Short White, in the average of the six years' experiments, has given an average of 28 tons per acre per annum. This is fully five tons per acre more than the old White Belgian variety. Those varieties of carrots which have roots which are white, comparatively short, and cone-shaped, are the ones which have taken the lead in recent years. There is really but little difference in the four highest varieties mentioned in the list.

Varieties of Kohl Rabi.

Kohl Rabi, as a class of roots, is not grown extensively in Ontario. The plants resemble cabbages in their root development and swede turnips in the appearance of their leaves. The valuable part grows about three inches above ground in the form of a bulb. The Kohl Rabi, when used for domestic purposes, is prepared in much the same way as swede turnips. When grown as a food for stock, it is harvested and stored somewhat similar to mangels and turnips, although the crop is occasionally pastured off in the fall.

Three varieties of Kohl Rabi have been grown in the Experimental Department under similar conditions in each of ten years. The average yields in tons per acre in 1911 and the average of the ten years are as follows: Earliest Erfurt, 10.5, 17.5; Early White Vienna, 10.4, 17.1; and Goliath Purple, 11.4 and 14.8.

Varieties of Parsnips.

Some inquiries have been made in regard to the value of parsnips as a farm crop. To compare the productiveness of parsnips with other classes or roots, two varieties have now been under experiment at the College in each of seven years. The results in yield of roots per acre for 1911 and for the average of ten years are as follows: Sutton's Cattle, 10.8 and 11.4; and New Ideal Hollow Crown, 8.6 and 11.2.

Varieties of Fodder Corn.

The number of acres used for the growing of fodder corn in Ontario during each of the past five years is as follows: 1907, 200,354; 1908, 233,753; 1909, 288,346; 1910, 326,627; and 1911, 335,935. Although there was practically no increase in the acreage of fodder corn in Ontario for the ten years previous to 1907, there has certainly been a marked increase in the amount of land used for this crop during the past five years. In comparison with these figures it might be well to mention that the acreage of corn grown in Ontario for husking has been somewhat lower during the past four years than it was ten or twelve years previous. The average yield per acre of the fodder corn in Ontario in each of the past five years has been as follows: 1907, 10.1 tons; 1908, 11.7 tons; 1909, 11.7 tons; 1910, 11.6 tons and 1911, 11.2 tons. It will, therefore, be seen that although the past season has been exceptionally dry and hot the fodder corn of Ontario has produced almost a standard yield. As the average annual production of fodder corn in Ontario for the past twelve years has been 11.45 tons per acre and as the yield of this crop in 1911 was 11.21 tons per acre, it shows the great value of fodder corn in Ontario, even in a comparatively dry season when so many of the crops proved to be a partial failure. Those counties in Ontario in which the fodder corn was grown the most extensively in 1911 were as follows: Oxford, 281,819 tons; Middlesex, 216,915 tons; Bruce, 198,541 tons; York, 160,198 tons; Huron, 141,811 tons; Perth, 141,576 tons; Hastings, 140,423 tons; Grey, 135,235 tons; Leeds, 127,908 tons; and Lanark, 127,612 tons.

Those familiar with corn growing will understand that no one variety of corn would prove the best variety for all parts of Ontario. While this is true it is also equally true that there are some varieties of corn which are much more suitable to any one locality than certain other varieties. It is of the greatest importance to secure those varieties which are particularly suited to the localities in which they are to be grown. In order to ascertain which is the most suitable variety for any one locality it is important for each farmer to do a certain amount of

experimental work for himself. Before undertaking this work, however, he should make the very best use possible of the information which he can obtain from experiments conducted in different places in Ontario. In this search for information he can obtain great assistance from results of experiments which have been conducted at our College with a large number of varieties where not only the total yield per acre but also the yield of ears, the stage of maturity, etc., are taken into consideration. The variety experiments conducted at the College should serve as a general guide to the farmers in most parts of Ontario indicating to them the kinds which are likely to be suitable to their respective requirements. The requirements of the different localities are so different that it seems necessary to give the results of a large number of varieties which can be studied by individual farmers in order that the greatest value from the experiments can be obtained. We are, therefore, presenting the average of five years' experiments of each of forty-seven varieties of corn which have been grown under uniform conditions. The experiment was conducted in duplicate each year, so that we have the average of ten distinct tests made within the five-year period. For these experiments the corn was usually planted during the last ten days in May and it was harvested about the middle of September. Immediately after the crop was cut, the weight of the whole crop was taken, then the ears were husked, counted, weighed and examined. The stage of the maturity of the corn was indicated by the condition of the grain at the time it was harvested. The seven terms which were used to describe the condition of the corn in regard to its ripeness at the time of husking were as follows: Water, Early Milk, Milk, Late Milk, Dough, Firm Dough and Ripe. The varieties on the list are arranged according to the total yield of green crop per acre, including, of course, the stalks, the leaves and the ears.

The tabulated results here presented are worthy of careful study by farmers of Ontario who wish to grow the very best varieties for their own farms. From these results many suggestions can be obtained. Every farmer has a very good knowledge of the habits and the results of one or more varieties of corn for his own farm or for his own locality. By comparing the results of the other varieties on the list with the one variety of corn with which he is the most familiar he is in a position to get a general idea as to whether any of these varieties would be likely to give better results than the variety which has been grown in his neighborhood. Although the Eureka variety of corn stands at the head of the list in total yield of crop per acre, the tabulated results will show that it would be quite unsuitable for nearly all the different localities in Ontario, owing to the fact that when harvested in an average year the grain is only in the early milk condition. The Salzer's North Dakota, which stands seventh in the list of total crop is much earlier than Eureka, as the grain reached the dough condition in the experiments at Guelph. It required exactly two weeks longer for the Eureka than for the Salzer's North Dakota to come into blossom. The Wisconsin No. 7 comes into blossom about one day earlier than the Salzer's North Dakota, and produces a total yield of about one ton per acre less, but gives a yield of husked ears of two-fifths of a ton per acre more than that variety. As a rule, the larger the variety the longer the season required for its growth. There are, however, many exceptions to this general rule. Rather than to grow a late variety it is better to grow a corn which will not only give a large yield per acre but will also produce a comparatively high yield of ears and will reach a good stage of maturity in the locality in which it is grown before there is much danger of frost.

VARIETIES OF CORN.

Varieties.	Description of Varieties.		Average Results of Five Years' Experiments—1907-11.					
	Class of Corn and Color of Grain.	Average number of rows per ear. 5 years.	Condition of Grain when harvested.	Number of days until in full tassel.	Height of Plants.	Weight per ear.	Yield per Acre.	
							Husked Ears.	Total Crop Green.
					Inches.	Ounces.	Tons.	Tons.
1. Eureka	Yellow Dent	16	Early Milk	104	121	7.14	2.71	**24.68**
2. Mogul	White Dent	18	Early Milk	103	113	5.94	2.75	**21.00**
3. Landreth's Large White Flint	White Flint	12	Early Milk	103	115	5.57	2.39	**20.78**
4. Gold Nugget	Yellow Flint	8	Firm Dough	85	103	9.21	4.45	**19.50**
5. Reid's Yellow Dent	Yellow Dent	18	Early Milk	98	112	6.77	2.99	**19.42**
6. Marblehead Mammoth	Sweet	14	Milk	94	90	7.39	3.43	**19.20**
7. Salzer's North Dakota	White Flint	8	Dough	90	97	6.54	3.61	**18.96**
8. Indian White Flour	Flour	8	Dough	86	98	7.98	3.95	**18.90**
9. Stowell's Evergreen	Sweet	14–16	Milk	96	95	6.29	2.95	**18.71**
10. Golden West	Yellow Dent	16	Milk	96	109	6.81	2.93	**18.40**
11. Hoopengardner's Very Early Yellow Dent	Yellow Dent	16	Late Milk	89	108	9.59	4.50	**18.16**
12. Mammoth Southern Sweet	White Dent	14–16	Early Milk	101	108	5.79	2.20	**17.93**
13. Wisconsin No. 7	White Dent	16	Milk	89	103	8.99	4.07	**17.92**
14. Early Butler	Yellow Dent	14–16	Milk	91	111	7.38	3.54	**17.82**
15. Improved Leaming (Vick)	Yellow Dent	16–18	Milk	92	110	8.33	3.60	**17.44**
16. Compton's Early (Duke)	Yellow Flint	12	Firm Dough	84	100	8.59	4.24	**17.44**
17. Longfellow	Yellow Flint	8	Firm Dough	87	95	5.91	3.11	**17.43**
18. Smith's White Cap Yellow Dent (Duke)	Yellow Dent	14–16	Late Milk	88	107	9.50	4.08	**17.25**
19. White Cap Yellow Dent (Dawson)	Yellow Dent	14	Late Milk	86	107	8.39	3.92	**16.87**
20. Bailey (Duke)	Yellow Dent	16	Late Milk	87	104	8.49	3.96	**16.79**
21. King Phillip (Duke)	Colored Flint	8	Firm Dough	84	96	6.73	3.42	**16.66**
22. Compton's Early	Yellow Flint	12	Firm Dough	85	98	7.79	3.68	**16.48**
23. Mayfield Earliest	White Dent	14–16	Late Milk	88	99	8.28	3.62	**16.41**
24. Leaming (Duke)	Yellow Dent	16–18	Late Milk	89	107	8.91	3.90	**15.91**
25. Madison Yellow Dent	Yellow Dent	16	Milk	87	103	8.45	3.86	**15.82**
26. Longfellow (Duke)	Yellow Flint	8	Ripe	81	93	6.17	3.29	**15.71**
27. Country Gentleman	Sweet	22	Milk	94	88	5.29	2.97	**15.61**
28. White Cap Yellow Dent (E. M. Zavitz)	Yellow Dent	14	Dough	83	105	8.66	3.95	**15.57**
29. Australian Extra Early Eight Rowed White	White Flint	10–12	Firm Dough	83	94	7.46	3.88	**15.32**
30. Canada Yellow	Yellow Flint	8	Firm Dough	84	89	5.78	3.09	**15.30**

31. Early California Flint	Yellow Flint	12	Ripe	81	91	7.57	4.13	**15.18**
32. Genesee Valley	Yellow Flint	8	Firm Dough	81	90	6.36	3.22	**15.13**
33. Golden Glow or Wisconsin No. 12	Yellow Dent	16	Dough	84	101	8.64	4.13	**14.99**
34. White Cap Yellow Dent (Thomas)	Yellow Dent	12–14	Late Milk	83	100	7.81	3.68	**14.86**
35. Wessel	Yellow Flint	8	Ripe	81	95	6.94	3.54	**14.56**
36. Red Blazed	Colored Flint	8	Ripe	81	94	7.11	3.38	**14.51**
37. White Cap Yellow Dent (Hammond)	Yellow Dent	14	Dough	82	99	8.02	3.80	**14.49**
38. Sterling White Dent	White Dent	14	Dough	84	97	8.30	3.69	**14.48**
39. Rhode Island White Cap Flint	White Flint	8	Ripe	80	86	5.60	3.15	**14.35**
40. University No. 13	Yellow Dent	16	Firm Dough	81	97	7.75	3.88	**13.73**
41. Howling Mob	Sweet	12–14	Late Milk	80	77	8.23	4.36	**13.24**
42. Wisconsin No. 8	Yellow Dent	16	Dough	84	96	8.07	3.64	**13.11**
43. Pearce's Early Evergreen	Sweet	14	Late Milk	79	82	7.99	4.28	**13.07**
44. Mammoth White Cory	Sweet	8	Dough	78	69	5.77	3.40	**11.84**
45. Wisconsin Little Dent	Yellow Dent	14	Ripe	76	89	7.48	3.59	**10.41**
46. Golden Bantam	Sweet	8	Dough	76	61	3.97	2.70	**8.80**
47. Malakhoff	Sweet	10	Firm Dough	70	54	2.65	2.53	**8.00**

It will be seen that not only are there distinct varieties included in this experiment but there are also a number of strains of the same variety. These different strains have been selected by individual farmers for a number of years and, no doubt, as the result of different selections in the various localities, we are able to observe variations in several characteristics. The Smith's White Cap Yellow Dent required 88 days to come into full tassel while the Hammond's White Cap, Yellow Dent was in full tassel six days earlier. The Smith's White Cap Yellow Dent had only reached the late milk stage at the time of husking, while the Hammond's strain had reached the dough condition. Smith's corn, however, gave fully seventeen tons of total crop per acre, while the Hammond's corn gave only about fourteen and one-half tons per acre. It will, therefore, be seen that for growing corn for the silo or for dry fodder it is important, not only to secure the best varieties but also to secure the best strains of the best varieties. In the spring of each year the Experimental Union distributes throughout Ontario seed for three experiments with corn, one with fodder corn, one with varieties of corn for husking and one with sweet corn for table use. Usually three different varieties are distributed for each of these experiments, which enables the farmers to ascertain for themselves which of the most promising varieties conducted in the experiments at Guelph will produce the most satisfactory results on the individual farms.

Varieties of Sorghum for Fodder.

Under the term sorghum are included such crops as sugar cane, broom corn, millo maize, Kaffir corn, and Jerusalem corn. These are nearly all used more or less for fodder production and some of them are used for other purposes, such as sugar cane for the production of syrup, broom corn for the production of material for the manufacture of brooms and whisks, Jerusalem corn for the production of grain, which is extensively used as human food in some of the Eastern countries.

Varieties.	Height.		Yield of Heads per acre.		Total yield per acre.	
	1911	Average 13 years 1899-11	1911	Average 13 years 1899-11	1911	Average 13 years 1899-11
	Ins.	Ins.	Tons.	Tons.	Tons.	Tons.
Orange Sugar Cane	82	90	.25	.33	14.75	**18.26**
Early Minnesota Sugar Cane	119	105	.48	.75	15.95	**17.04**
Early Amber Sugar Cane	103	94	.85	.95	10.55	**15.60**
White Kaffir Corn	69	67	.25	.69	12.80	**12.72**
California Golden Broom Corn	123	110	.63	1.42	12.25	**11.27**
Early Japanese Broom Corn	111	105	.33	1.38	11.60	**9.73**
Improved Evergreen Broom Corn	105	106	1.26	1.31	9.20	**9.39**
Yellow Millo Maize	66	68	.36	.60	10.50	**8.80**
Jerusalem Corn	65	62	.18	.58	2.85	**5.59**

The sorghums thrive well in a comparatively hot, dry season when the corn makes a much slower growth. In the experimental plots at Guelph none of the varieties have been used for silage and only one variety of Early Amber Sugar Cane has been used extensively for pasture. For the production of fodder, however, eleven varieties were under experiment in 1911. Of this number nine varieties have been grown under similar conditions in the Experimental Department

in each of thirteen years. The seed was planted each year about the same as corn, except somewhat closer together. Three plants were allowed to remain in each hill and the hills were about twenty-seven inches apart each way. In each year the sorghum received cultivation throughout as required. The experiment was conducted in duplicate in the past season.

There is certainly a very marked difference in the average yield of fodder per acre obtained from the different varieties of Sorghum. The Jerusalem corn, which a few years ago was advertised very extensively, gave as the average results for thirteen years a yield of less than six tons per acre. In comparison with this we have the yield for the Orange Sugar Cane for the same period and under similar conditions, of upwards of eighteen tons of green crop per acre per annum. Although the Orange Sugar Cane gave a yield of fully two tons per acre more than the Early Amber Sugar Cane, the first named variety is much later in reaching maturity, as indicated by the yield of heads per acre. Although the broom corns surpassed the sugar canes in yield of seed per acre, as seen by reference to another part of this report, and as indicated by the yield of heads shown in the tabulated results, yet the total crop per acre of the sugar canes is decidedly greater than that of the broom corns. In fact, the highest average yield per acre of the broom corn is nearly 4½ tons per acre less than the lowest yield obtained from sugar cane. The Kaffir corn, regarding which much has been written in the newspapers on certain occasions and which has also been pretty extensively advertised by some of the seedsmen of the country, in yield per acre is considerably lower than any one of the sugar canes, the results of which are here presented. The early Amber Sugar Cane has been grown quite extensively in some parts of Ontario, where it gives good yields of fodder and is greatly relished by farm stock. In the absence of a silo, sugar cane can be fed in the dry condition and as soon as the cattle are familiar with the crop it is eaten very readily. The sugar cane when fed dry seems to be very much more relished than fodder corn when fed in the same condition.

Varieties of Millet for Fodder Purposes.

In Ontario millet is used for the production of green fodder or of hay rather than for seed production, although in some sections millet seed is grown as a profitable source of revenue. Some farmers grow millet more or less extensively as a regular crop, but as a rule it is sown to supplement some other crop which for some cause or other has proven a partial failure. It is found that in certain seasons the amount of rainfall is so abundant during the latter part of May or the early part of June that it is impossible to get corn planted in good condition, in which case the land can be used to good advantage in growing millet as it does not require to be sown until later in the season. In this way the loss of the corn crop would not be felt as seriously as it would have been had not a fodder crop been secured from the land. It will, therefore, be seen that the millet crop is frequently an important one for the farmers of the Province as it can be used to good advantage after it has been found that the supply of other coarse fodder is apt to be deficient.

Twenty-two different varieties and different strains of millet were grown at the College in 1911. The yields, however, were comparatively low. Those which gave the greatest number of tons of green crop per acre were: Holy Terror Gold Mine, 7.3; Japanese Panicle, 7.1; and Hungarian Grass, 6.8 tons per acre. As nine different varieties of millet have been grown for at least five years in suc-

cession, the results should be of a considerable amount of value. The following table gives the results for 1911 and for the average of five years in height, yield of green crop and yield of hay per acre:

Varieties.	Height.		Yield per acre.			
			Green Fodder.		Hay.	
	1911.	Average 5 years 1907–11.	1911.	Average 5 years 1907–11.	1911.	Average 5 years 1907–11.
	ins.	ins.	tons.	tons.	tons.	tons.
Japanese Panicle	36	39	7.10	9.33	3.15	**4.10**
Holy Terror Gold Mine	33	33	7.25	8.53	3.05	**3.65**
Golden Wonder	33	33	6.45	7.94	2.75	**3.36**
Hungarian Grass	34	33	6.75	7.83	3.15	**3.35**
Steel Trust	33	32	5.56	7.91	2.45	**3.30**
Siberian	33	32	6.30	7.61	2.75	**3.23**
German or Golden	36	33	6.25	7.16	2.80	**2.98**
Common	36	33	6.40	7.11	2.95	**2.96**
Japanese Barnyard	23	33	4.35	6.74	1.35	**2.69**

The Japanese Panicle variety of millet, which stands at the head of the list in yield of hay per acre in the five years' experiments, was brought from Japan by Prof. Brooks, of the Agricultural College at Amherst, Mass. Prof. Brooks had occupied a position on the staff of an Agricultural College in Japan for seven years previous to his return to the United States. The Japanese Panicle millet produces plants of an upright growth and a spreading head. There is a large development of leaf and the crop usually lodges much less than a number of the other millets. A number of seedsmen *illustrate* in their catalogues the Japanese Panicle millet and *describe* the Japanese Barnyard variety as if these two were the same kind. They are entirely different in appearance and certainly have produced results of a very wide range, the Japanese Barnyard coming at the bottom, and the Japanese Panicle at the top of the list in yield of green crop and in yield of hay per acre in the average results for five years. In ordering the Japanese Panicle millet it is wise to first obtain a sample and be sure that the seeds are of a dark brown color and very shiny. The Japanese Panicle and the Japanese Barnyard millets not only represent different varieties but actually different species. In the average results for five years the common millet produced about three tons and the Hungarian Grass 3 1-3 tons of hay per acre. The Siberian variety of millet, which is a heavy yielder of seed, stands sixth in the list in yield of hay, the average for the five years being about 3 1-5 tons per acre per annum.

Sowing Millet at Different Dates.

In each of six years an experiment has been conducted with the object of gleaning information regarding the best time for sowing millet seed for the production of green fodder and of hay. Three varieties which are quite different in their characteristics have been used for this experiment, viz., the Japanese Panicle, the Japanese Barnyard Grass and the Hungarian Grass. The seeding took place about the first of May in each of the years with the exception of 1909 and the

succeeding seedings every half month until all the seven seedings were made, except in 1909, when only six seedings were used. As it is difficult to make hay of the crop produced from the late seedings, especially for the Japanese Panicle variety, the results here presented are for the green crop only. The following table gives the average yield of green crop per acre per annum for the last six years of each of the varieties from six different dates of seeding and also for the average of the three varieties.

Dates of Seeding.	Average Yield of Green Crop per Acre.			
	Japanese Panicle.	Japanese Barnyard.	Hungarian Grass.	Average, 3 varieties.
	Tons.	Tons.	Tons.	Tons.
May 15th	8.28	6.41	6.98	**7.22**
June 1st	9.25	7.73	7.85	**8.28**
June 15th	9.08	6.84	7.46	**7.79**
July 1st	6.75	6.33	7.29	**6.79**
July 15th	6.30	5.07	6.46	**5.94**
August 1st	.....	.....	3.09	.....

The highest average yield of green crop per acre was produced from the seeding of June 1st in the case of each of the three varieties. A careful study of the table, however, will show that the Hungarian Grass will stand the latest seeding of the three varieties and that the Japanese Barnyard Grass occupies a medium place in this respect. The Japanese Panicle variety, requiring a comparatively long season for its growth, should be sown either the latter part of May or during the first half of June. The Hungarian Grass, however, will give very good results when sown even as late as July. It will be seen that the Hungarian Grass when sown about the first of July usually gives a larger yield of green crop per acre than when sown six weeks earlier. It is important to notice that none of the millets when sown in May will give as good results as they do when they are sown about the first or the 15th of June.

Varieties of Sunfowers for Fodder.

We have already reported on different varieties of sunflowers for seed production, and it still remains for us to draw attention to the results of this crop from the standpoint of a supply of coarse fodder. The seed of the sunflowers usually germinate quickly. Under cultivation the plants grow rapidly and soon completely cover the ground. As discussions have been carried on in past years in regard to the use of sunflower heads for mixing with corn in the silo, experiments have been conducted at the College to ascertain the yield of heads per acre and the comparative value of the different varieties of sunflowers for this purpose. Seven varieties were grown in the Experimental Department for several years in succession and three of these have now been under test for sixteen years. The three varieties which have been grown in each of sixteen years have given an average yield in tons per acre of heads and of whole crop as follows: Black Giant, 6.2 and 21; White Beauty, 5.8 and 17.1; and Mammoth Russian, 5.6 and 17. The White Beauty variety has been grown for fourteen instead of sixteen years. In 1911, a year in which so many of the crops gave comparatively light yields per

acre, the sunflowers were very prolific, the Black Giant averaging 29.3, the White Beauty, 28.6 and the Mammoth Russian, 24.4 tons per acre. In yield of heads per acre during the past year, the Black Giant gave 7.7, the White Beauty, 6.9 and the Mammoth Russian, 6.5 tons.

Varieties of Rape, Cow Cabbage, Kale, Etc.

The Dwarf Essex Rape has been grown more or less in the Province of Ontario for many years. The rape plant resembles the Swede turnip in its leaf and the cabbage in its root. It is the leaf and the stem which furnishes the valuable portion for feeding to live stock. Rape makes an excellent late summer and autumn crop for fattening cattle, sheep and lambs for which purpose it has been used at the College quite extensively in past years. Over 600 lambs were pastured on rape on the College farm a few years ago. The lambs did exceptionally well, remaining in good health and increasing rapidly in weight.

There are a number of crops which can be handled in much the same way for feeding in the autumn as green fodder or as pasture. It is, therefore, interesting to make a study of rape, kale, cabbage, etc., in order to have a knowledge of the comparative results of these crops when grown in Ontario under similar conditions. Some of these crops which are not known well in Ontario are grown quite extensively in Great Britain.

There were in all fifteen varieties of rape, kale, etc., under test in the College plots in 1911. The crops were all sown in rows 3 1-3 links (26 2-5 inches) apart. Each plot was exactly 1-100 of an acre in size, consisting of three rows each four rods in length. The seed was sown at the rate of two pounds per acre and the plants of each variety were thinned to two inches apart in the rows. In general practice, however, it would be wise to sow about 1½ pounds of seed per acre and omit the thinning. The land between the rows was cultivated occasionally throughout the growing season. The seedings in 1909 and in 1910 took place on June 21st, and in 1911 on June 20th, which is about a week later than the usual time of sowing. When the crops had reached their best condition for feeding, each variety was cut with a scythe and weighed immediately.

It will be understood that the seed of the Cow Cabbage as well as that of the rape was sown in drills and the plants were left comparatively close together. In England the cabbage seed is frequently sown in the garden or in hot beds and the young plants are transplanted in the field at a sufficient distance apart to produce large heads. This, however, requires a good deal of labor, which is an important item in connection with agriculture in Ontario at the present time. In this experiment the different varieties of cabbage have been treated in the same way as rape and kale. The heads of the cabbage, therefore, have been quite small, the growth being principally leaf and stem. Additional experiments are under way in determining the comparative value of the different varieties of Cow Cabbage when grown closely together as compared with the crop grown more widely apart, so that the heads are allowed to form. No satisfactory results, however, have been obtained for presentation in regard to this part of the experiment.

The highest yielding cabbage has given a yield of 30.6 tons per acre per annum for the five year period. This is certainly a very high yield of crop per acre, surpassing any of the varieties of corn under experiment. The seed of the World Beater Cabbage, which now occupies the highest place in average yield per acre, was obtained from Darch and Hunter, London, Ont. Two other varieties, viz., the

Early German Brunswick cabbage and the Matchless Flat Dutch cabbage have been obtained from J. A. Simmers & Co., Toronto, and have been under experiment for four years. These two varieties, however, have not given quite as high a yield per acre as the World Beater cabbage. The three varieties which occupy 2nd, 3rd and 4th places on the list are all varieties obtained from Sutton & Son, Reading, Eng. The Dwarf Essex Rape, which is known better than any other variety of cabbage, rape or kale reported in the list, has given an average of 23.6 tons per acre. The seed of the Dwarf Essex Rape is about Ten Cents per pound, that of the Early Drumhead cabbage about One Dollar and Twenty-five Cents per pound, and that of the World Beater cabbage about Two Dollars per pound. If the seed is of good quality it usually requires about 1½ pounds per acre when sown in drills. The Dwarf Essex Rape did exceptionally well in 1911, giving 31.4 tons of green crop per acre.

Varieties.	Height.		Green Fodder. Per Acre.	
	1911.	Average 5 years 1907–1911.	1911.	Average 5 years 1907–1911.
	ins.	ins.	tons.	tons.
World Beater Cabbage	17	19	30.2	**30.6**
Sutton's Earliest Drumhead Cabbage	17	20	26.1	**27.6**
Sutton's Giant Drumhead Cabbage	19	20	28.6	**26.8**
Sutton s Earliest Sheepfold Cabbage	17	18	27.0	**25.8**
Thousand Headed Kale	31	35	24.0	**25.7**
Large Seeded Umbrella Rape	30	30	29.4	**24.5**
Dwarf Essex Rape	26	30	31.4	**23.6**
Purple Sprouting Boroccoli	27	31	24.4	**21.8**
Cabbage Leafed Rape	34	34	20.7	**21.0**
Jersey Kale	28	33	14.0	**19.7**

Six varieties of rape, kale and cabbage have been grown in the Experimental grounds in each of twelve years. The following gives the average results of the duplicate experiment for 1911, and also the average yield per acre per annum for the twelve-year period:

Variety.	1911.	Average, 12 years.
	tons.	tons.
Sutton's Earliest Drumhead Cabbage	26.1	**24.5**
Thousand Headed Kale	24.0	**22.3**
Sutton's Earliest Sheepfold Cabbage	27.0	**21.3**
Dwarf Essex Rape	31.4	**20.9**
Purple Sprouting Boroccoli	24.4	**19.8**
Jersey Kale	14.0	**17.9**

As these results are for a period of twelve years, they should be very serviceable indeed as a general guide, as they cover so many different conditions of temperature, rainfall, etc. It will be seen that the Earliest Drumhead Cabbage surpassed the Dwarf Essex Rape in the twelve year period by fully 3½ tons of green crop per acre per annum. The Thousand Headed Kale occupies a intermediate position between these two varieties.

Miscellaneous Leguminous Crops for Green Fodder.

Seventeen varieties and strains of soy beans, cow peas, vetches and grass peas were grown in the experimental grounds in 1911 for fodder production. The crops, however, were unusually light during the past season, and even the yields of the best were rather unsatisfactory. The most of the varieties of cow peas and soy beans require too long a season for growth to give satisfactory results in Ontario. There are some, however, that usually reach sufficient maturity for fodder purposes and a few generally produce ripened seed. The greatest yields per acre in 1911 were produced by Chernie soy beans, 5 tons; Habara soy beans, 4.6 tons; Early Yellow soy beans, 4.4 tons; Medium Green soy beans, 3.9 tons, and Hairy Vetches, 3.6 tons.

Four varieties of leguminous crops have been grown for fodder production in each of the past eleven years with the following average results for the whole period in height of the crop in inches and in yields of green fodder per acre in tons:

Varieties.	Height, Ins.	Yield per Acre, Tons.
Hairy Vetches	29	**7.1**
Grass Peas	33	**6.8**
Early Yellow Soy Beans	25	**6.5**
Wonderful Cow Peas	15	**4.9**

The Hairy Vetches have, therefore, given the highest yield of green crop per acre of the four leguminous crops grown for eleven years under similar conditions. In the average results for the past seven years in which five different kinds of leguminous crops have been under test, the Ito San Soy beans stands the highest in yield of green crop per acre, the average being 6.8 tons. In comparison with these results the Grass peas gave 6.2 tons; the Early Yellow Soy beans, 5.4 tons; Hairy Vetches, 5.3 tons, and the Wonderful Cow Peas, 4.8 tons per acre. Besides the Hairy Vetches being used as a fodder crop they are sometimes used in some sections of Ontario as a cover crop for orchards, for which purpose they are very highly spoken of by fruit men who have used them in this way.

Varieties of Timothy.

There is probably no variety of grass which is used so extensively in Ontario for hay and for pasture as timothy. As a pasture crop, however, it gives very poor results in a hot dry time in the summer when the pasture is needed the most. A large amount of experimental work has been done at the College in comparing Timothy with other grasses, such as Meadow Fescue, Awnless Brome, Meadow Foxtail, Red Top, Canadian Blue, Kentucky Blue grass, etc., and the results have been reported from time to time. In 1907, however, an experiment was started with the object of ascertaining information regarding the results of different strains and varieties of Timothy. Several years ago Dr. Hopkins, formerly of the Agricultural Experiment Station at Morgantown, West Virginia, carried on some extensive work in starting new strains of Timothy from selected plants. From a very large number of selections which Dr. Hopkins made, he finally chose three of the very best for fulfilling certain requirements. When in Washington in the autumn of 1906 I secured a small quantity of seed of each of these strains, and in the fol-

lowing spring we sowed each kind in duplicate plots. The germination was very good, there being an even catch of Timothy over each plot. In addition to the three strains of Timothy obtained from Dr. Hopkins, the ordinary variety of Timothy grown in Ontario was sown as a basis for comparison. The crops were cut in each year and careful records were made of the yields produced. The following table gives the yield in tons per acre of each variety of Timothy in each of the past four years and the average yield per acre for the four year period:

Varieties.	Tons of Hay per acre.				
	1908	1909	1910	1911	Average 4 years.
Common Timothy	2.13	1.43	.95	.88	1.35
Early Timothy	2.52	1.58	1.03	.88	1.50
Stewart's Mammoth Timothy	1.84	1.50	1.10	.93	1.34
Pasture Timothy	2.85	1.75	1.13	.80	1.63

It will be seen from the results here presented that two of the selected strains of Timothy have given greater yields of hay than the Common Timothy of Ontario.

Some interesting experiments with fertilizers and Timothy have been under way for the past three years and if possible the results of these experiments may be presented at the end of 1912.

Red Clover.

Ontario farmers should be very careful to make the best possible use of Red Clover in connection with their short rotations. This is a plant of exceedingly great value, as it produces heavy crops of nutritious material for farm stock and also assists largely in the improvement of the soil by appropriating free nitrogen of the atmosphere, by securing valuable fertilizing elements from the subsoil and by greatly improving the mechanical conditions of the soil at the surface. In some respects there is no other plants which can exactly take the place of clover on the farms of Ontario. Great care, therefore, should be taken in the endeavor to make the conditions very favorable for a good catch of clover when the seed is sown. On some farms in Ontario it seems as if grain crops have been grown so extensively that the humus of the soil has become very deficient, and that it is now difficult to secure a good growth of clover. I believe, however, that it is still possible to bring practically every farm in Ontario into that condition in which the Red Clover can be grown successfully except in exceptional years when the crop becomes destroyed through unfavorable conditions of the weather. In order, however, to get good results from clover it is important to have the land properly underdrained, to conduct a good rotation of crops, to incorporate a sufficient amount of humus in the soil by the addition of barnyard manure, green manure, etc., and to sow good clover seed quite early in the spring of the year either on a winter crop or a spring grain which is not sown too thickly and which has a properly prepared seed bed. Numerous experiments with Red Clover have been conducted at the College in past years, and have been reported from time to time. Some most interesting results have been obtained from growing three varieties of clover, alfalfa, and three varieties of grasses on the land, after which the soil has been studied

from a mechanical standpoint, and also from the standpoint of the influence on future crops. It was found that the land on which Red Clover had been grown was more easily plowed and was in a more friable condition than land on which Timothy, Meadow Fescue or Orchard Grass had been grown. The clover sod gave considerably larger yields of barley, of winter wheat and of mixed grain per acre than was obtained from any one of the grass sods.

Alfalfa or Lucerne.

While it is true that Red Clover has a very important place in the agriculture of Ontario, it is also true that Alfalfa or Lucerne has an important place to fill.

Alfalfa can be satisfactorily grown on many farms in Ontario. Its large yields of nutritious feed for farm stock, its perennial character of growth and its beneficial influence on the soil are all features which commend it very highly for those farms on which it can be grown successfully. From experiments conducted at the Ontario Agricultural College during the past fifteen years, we would offer the following suggestions for its cultivation.

Select lands having a clean, mellow, fertile surface soil overlying a deeply drained, sweet subsoil. Use large plump seed of a hardy variety and which is free from impurities and strong in germinating power. Inoculate the seed with the proper kind of bacteria, providing alfalfa has not been grown successfully on the land in recent years. The seeding can take place according to any one of the following methods:

1. Alfalfa seed may frequently be sown on winter wheat in the early spring either on the old snow or on a fresh snow of one or two inches, and no harrowing or cultivation is necessary.

2. On a suitable seed bed and as soon as the land is sufficiently dry in the spring, alfalfa seed may be sown at the rate of about twenty pounds per acre from the grass seed box placed in front of the grain drill. About one bushel of barley or spring wheat per acre sown from the tubes of the drill makes a very good nurse crop. After the seed is sown the land should be harrowed lightly.

3. Alfalfa may usually be sown alone to good advantage in the month of July on a summer fallow, providing there is sufficient moisture for good germination.

Alfalfa should never be pastured during the first year and seldom, if ever, afterwards unless in very exceptional cases as pasturing very frequently destroys the alfalfa plants. The alfalfa crop should be cut for hay or for green fodder in the following year after the seeding takes place as soon as it starts to bloom. Care should be taken to retain as many of the leaves on the stems as possible, and to protect the crop from rain. If these directions are followed, the alfalfa may be expected to produce large and valuable crops for a number of years without reseeding. In many places in Ontario the alfalfa will produce from two to three crops of hay per acre per annum, and in some localities hay can be obtained from the first crop and seed from the second crop in most seasons. The following table gives the yields per acre of the different cuttings for both green fodder and hay of alfalfa, as produced at the College in each of fourteen years:

Years.	Green crop.					Hay.				
	First Cutting	Second Cutting	Third Cutting	Fourth Cutting	Total.	First Cutting	Second Cutting	Third Cutting	Fourth Cutting	Total.
	Tons.	Tons	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1896.....	9.96	6.47	4.06	2.06	**22.55**	3.08	1.91	1.29	.65	**6.93**
1897.....	12.04	5.61	4.42	.....	**22.08**	3.59	1.56	1.23	.....	**6.38**
1898.....	9.71	5.85	2.64	.....	**18.20**	2.30	1.75	.63	.....	**4.68**
1900.....	11.93	6.00	1.60	.....	**19.53**	2.33	1.47	.80	.....	**4.60**
1901.....	9.70	2.20	7.49	.....	**19.39**	2.03	1.00	1.50	.....	**4.53**
1902.....	13.35	8.69	2.96	.....	**25.00**	2.50	2.02	.54	.....	**5.06**
1903.....	13.10	8.53	2.75	.....	**24.38**	2.50	2.09	.67	.....	**5.25**
1904.....	12.45	9.35	4.00	.....	**25.80**	3.40	2.50	1.08	.....	**6.98**
1906.....	9.78	6.60	4.85	.....	**21.23**	2.55	1.13	.58	.....	**4.26**
1907.....	14.55	3.95	.....	.....	**18.50**	2.95	1.05	.....	.....	**4.00**
1908.....	9.70	6.75	3.73	.....	**20.18**	2.50	1.15	.75	.....	**4.40**
1909.....	8.68	4.56	.84	.....	**14.08**	2.52	1.40	.14	.....	**4.06**
1910.....	15.08	3.88	4.76	.....	**23.72**	2.94	.80	1.32	.....	**5.06**
1911.....	8.00	1.80	1.36	.....	**11.16**	1.76	.34	.30	.....	**2.40**
Average 14 years....	11.29	5.73	3.24	.15	**20.41**	2.64	1.44	.77	.05	**4.90**

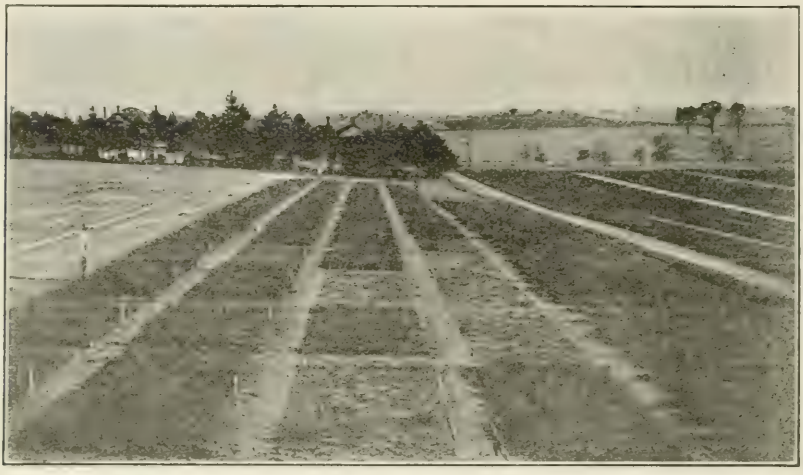
The results furnished in the accompanying table are those of experiments which took place in different parts of the experimental grounds, mostly in comparative tests with different varieties of clover. In each case the seed was sown in the spring of the year at the rate of 18 to 20 pounds per acre, and usually with a grain crop, such as barley, sown at the rate of one bushel per acre. In each of twelve years the alfalfa gave three cuttings, but in 1907 it produced only two, while in 1896 it gave four cuttings in the one season. The spring of 1896 opened up very early and that of 1907 exceptionally late. The highest average yield of hay per acre was produced in 1904, in which year nearly seven tons per acre were obtained from the three cuttings. In comparison with this high yield we observe that the lowest production was in 1911, when less than 2½ tons per acre were obtained. In the average results for the fourteen years the alfalfa has produced an annual yield of upwards of twenty tons of green crop and of nearly five tons of hay per acre.

Canadian Variegated Alfalfa.

The whole number of species of Alfalfa is quite limited, and for our present consideration only two need to be mentioned, viz., the Common Alfalfa, *Medicago sativa,* and the Yellow Flowered alfalfa, *Medicago falcata.* The Common alfalfa has been grown extensively in many of the countries of the world in which the climate is not too severe. It possesses plants of an upright growth, flowers which are violet in color, and seed pods which are in the form of coils or spirals. The Yellow Flowered alfalfa grows wild in a number of the countries of Europe and Asia. Its use as a cultivated crop has been limited. The plants have a spreading habit of growth and are considered to be quite hardy. The flowers are yellow in color, and the pods are in the form of a crescent or a sickle.

Alfalfa plants are naturally cross-fertilized; hence, if plants of the Yellow Flowered alfalfa are grown in the midst of or in the near proximity to the Common variety, there is a natural crossing or mixing of the two kinds of alfalfa.

The apparent ease with which natural cross-fertilization takes place, explains the reason for the existence of the different kinds of alfalfa plants which vary more or less in their characteristics, particularly in their color of flowers and in their evident hardiness. Some of these hybrids which have received distinct names have been grouped into a general class which is now known as Variegated alfalfa. The United States Department of Agriculture has imported several lots of Variegated alfalfa from Europe and from Asia for experimental purposes. Besides these, we have in America the Sand lucerne of commerce, the Grimm alfalfa of Minnesota, and the Canadian Variegated alfalfa of Ontario, each of which has made high records in experiments conducted in Canada and in the United States. It is probably safe to say that the Grimm alfalfa of Minnesota and the Canadian Variegated alfalfa of Ontario are the two hardiest and most important varieties of alfalfa, the seed of which can be bought in Canada and in the United States.



A view of some of the Alfalfa plots. The difference of some of the strains in regard to hardiness is easily noticed.

It is known that the Canadian Variegated alfalfa is grown by farmers in certain parts of the counties of Lincoln, Welland, and Haldimand, and it is probably grown to a limited extent in some of the other counties of Ontario. In many sections of the Province, however, the Common and more tender variety from the Western States has been introduced in recent years. The Common alfalfa of the South-western and the Central Western States traces its history largely to South America, from which country it was brought to California about fifty years ago.

Taking into consideration the results both at our College and in the United States, we have much evidence to show that the Variegated Canadian alfalfa is very hardy and is worthy of special attention in the Province of Ontario.

Pasture Crops in Ontario.

In 1911 no less than 3,116,768 acres were used for pasture purposes in the Province of Ontario. There was a gradual increase in the pasture lands of the Province to the year 1906, and since that date the acreage in pasture has been slowly decreasing until it is now about the same as it was eight years ago. It is to be hoped that the recent decrease in the acreage in the pasture lands means better pastures and more intensive farming. I believe it is quite possible to greatly

reduce the acreage of pasture in Ontario and still secure as great an amount of pasture material as is obtained at the present time. In order to do this, however, it is necessary to give more attention to this important crop than it has been receiving in past years. In order to assist in this work the results of experiments at the College should prove of much service.

A Temporary Pasture of One Year's Duration.

Again in 1911, about ten acres were sown with the annual pasture mixture, and this was pastured by milch cows and furnished excellent results. The pasture experiment consisted of Oats, 51 lbs.; Early Amber Sugar Cane, 30 lbs.; and Common Red Clover, 7 lbs. per acre, or a total of 88 lbs. of the mixture per acre. The oats and the Early Amber sugar cane were mixed together and sown from the grain box of the seed drill, and the clover from the grass seed box placed in front of the tubes of the drill. This mixture was sown about the middle of May and was ready to pasture the latter part of June. The oats grew rapidly and

Cows pasturing on the Annual Pasture mixture.

formed the first pasture, the sugar cane being later formed a considerable amount of pasture in the hot, dry time in the summer, and the clover being the latest of all was the principal portion of the pasture in the autumn. Thus, by having a mixture of this kind there is a natural succession of pasture growth which forms a continuous supply throughout the season. All varieties are readily eaten by farm animals, especially the oats and the sugar cane. If desirable the clover when grown in the mixture here referred to may be allowed to remain over winter and furnish one or two cuttings in the following year. The tramping of the cattle has not caused any marked degree of injury either to the plants or to the soil. In each of the past five years, previous to 1911, we have had eight to nine acres of this pasture which has carried more than one two-year-old steer per acre. The animals have thrived splendidly, keeping in the best of health and gaining on the average about two pounds per day. In 1911, milch cows were used on the temporary pasture for the first time, and the results were very satisfactory both in the health of the animals and in the flow of milk.

Crop for Permanent Pasture.

Although the climate is not quite as favorable for permanent pastures in Canada as it is in parts of Scotland and of England, yet it is believed that the permanent pastures might be used to excellent advantage in many parts of Ontario. Land which is not required in the regular rotation of the farm can often be seeded with a permanent pasture mixture to excellent advantage. From more than twenty years work in testing different varieties of grasses and clovers, both singly and in combination, I would suggest the following varieties and amounts per acre for a permanent pasture mixture to be used under average conditions of soil, drainage and climate: Orchard Grass, 4 lbs.; Meadow Fescue, 4 lbs.; Tall Oat Grass, 3 lbs.; Meadow Foxtail, 2 lbs.; Timothy, 2 lbs.; Alfalfa or Lucerne, 5 lbs.; Alsike Clover, 2 lbs.; and White or Dutch Clover, 2 lbs. This makes a total mixture of 24 lbs. of seed per acre. The seed of this permanent pasture can be sown in the early spring either with or without a grain crop. It is better to follow some cultivated crop which has been carefully looked after during the previous season. If the seed is sown alone the tops of the plants should be cut occasionally during the summer and allowed to lie on the ground as a mulch. If a nurse crop is used, about one bushel of barley or wheat is recommended. As a rule, oats do not form a good nurse crop for a permanent pasture mixture. The seed for the permanent pasture should be sown in front and not behind the tube drill. Some of the finer seeds can be sown from the grass seed box and others by hand. Such a mixture as this when once well established on suitable land should produce a good pasture, appetizing to the animals, excellent in quality, abundant in growth and permanent in character. There is one plot of this mixture in the Experimental Department which was seeded ten years ago and which has produced crops annually during that period of time. Another plot of a similar mixture remained twelve years after it was first seeded. Its location prevented its being pastured but the crop was converted into hay each year and during the eleven years which it was cropped it produced an average of a little over five tons per acre per annum.

The results of experiments in Field Husbandry which are here presented convey with them the hope of the writer that they may prove of real value in the advancement of agriculture in this Province..

Respectfully submitted,

C. A. ZAVITZ.

PART XV.

THE LECTURER IN ECONOMICS.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit the following report:

My work in Economics began with a course of lectures to Second Year during the winter term of 1906. Since that time the work has expanded until at the present time all the students of the College with the exception of First Year are studying this subject. The aim, in general, is to make the student familiar with the Economical and Social questions of the day and to prepare him to take an active and intelligent part therein. In the Second Year it is the object to acquaint the students with the principles of Political Economy such as Production, Exchange, Principles of Money, Banking, etc.; in the Third Year a study is made of International Trade, Protection, Free Trade, Relative importance of Foreign and Domestic Commerce, Tariffs, and Reciprocal Trade;—always with chief reference to our own country—only dealing with others for purposes of illustration; while in Fourth Year the work is almost entirely upon the subject of Co-operation. Evidence as to the importance of this system to agriculturists is drawn from all sources. Its operation in England, France, Germany, Denmark and Ireland are demonstrated; the formation of local societies, methods of handling and distributing produce, of purchasing supplies, and the influence of the society upon the social life of the people, are all dealt with in so far as time will permit.

OUTSIDE WORK. At the present time this Department is attempting an agricultural study of the Province by counties, through the members of the graduating class who wish to take an Economic subject for their thesis work. In this connection the student is led by the free use of diagram and chart to present a description of the soil and sub-soil, the crops grown, the roads and railroad facilities and waterways. By the use of tables he shows variation of rural and urban population, assessed acreage, number and different kinds of live stock, land occupied, farm values. Note is also taken of the Agricultural Societies, field crops competitions, changes in system of agriculture practised, condition of land with regard to weeds, natural and artificial drainage, possibilities of these measures, kind of houses and barns, fences, farm wages, allied industries, attempts at reforestation, amount of slash and woodland, together with every possible detail in so far as information may be gathered from an agricultural point of view. Four counties have been very successfully handled up to the present time and it is the intention to continue the work until the whole Province is covered.

ENGLISH. My work in English Composition and in Public Speaking is steadily increasing as year by year the classes get larger. During the fall term it was found impossible to accommodate the whole Second Year anywhere around the institution, except in Massey Hall. This was a serious handicap to the work, as the building is entirely unsuited for class-room work—no blackboards, no rests for note books, and acoustic properties for work of this kind almost worthless. Discipline is seriously menaced under these conditions and indeed the net result of the lack of class-room accommodation is to dishearten those who aim at thoroughness in their teaching work.

In Public Speaking with the Second Year the largeness of the class again makes it impossible to do as much as one would like. Even when an opportunity is afforded for nine or ten men to speak at a session it takes about 12 sessions to get around the class once, so that four turns for each man is as much instruction as can be given in this subject in a term. The work, however, is made thoroughly enjoyable to the instructor by the interest and attention which the students devote to the work.

Respectfully submitted,
H. H. LeDrew.

PART XVI.

THE DIRECTOR OF HOME ECONOMICS.

To the President of the Ontario Agricultural College:

Sir,—I have the honour to submit herewith the eighth annual report of the work of the Home Economics Department for the year 1911.

The Home Economics Department adheres closely to the schedule of courses and classes which is clearly outlined in the calendar. There are few changes to report save minor ones which strengthen the training in household affairs, or the preparation for professional work. The classes have run smoothly as usual, and the value of the courses is evidenced by the rapidly increasing number of applications for admission. Research work is apparently out of the question when the time of the staff is so fully occupied with teaching, and our only extra work is the circulation of library material among the Women's Institutes.

The Normal Course in Domestic Science.

Sixteen entered the two-year course in 1909; fourteen passed on to the senior class in 1910; thirteen passed the final examinations and have received the Macdonald Institute Teacher's Certificate in Domestic Science. Fifteen were admitted to this course in September, 1910; fourteen have passed on to the senior class and are now in attendance. There were over fifty applications for entrance to this course last September. Our rule of holding all applications until June and then giving preference to those candidates with greatest maturity, scholarship and household experience, enabled us to choose a very strong class. Unfortunately, the kind of woman we prefer is in demand for many other lines of work, and several were tempted to drop out, but our long waiting list allowed us to fill the vacancies satisfactorily. The average age of this year's Junior Normal class is twenty-two, and it is undoubtedly the strongest we have had.

Eight were admitted to the One-Year Normal Course in September, 1910; six passed the final examinations in June, 1911; five have received the Macdonald Institute Teacher's Certificate in Domestic Science, and the sixth will receive hers when her Interim Second-Class Teacher's Certificate is replaced by an Ontario Permanent Second-Class Certificate. Nine out of forty applicants were admitted to the one-year course last September, and are now in attendance.

The Guelph public schools continue to send us four classes weekly for our practice-teaching. There may be an impression abroad that the interests of these classes are sacrificed to those of our students in training, but such is not the case, owing to our policy of providing an efficient critic teacher and rigidly limiting the Normal class to the number that the teacher can supervise properly. Each student-teacher is required to submit and discuss her plans for each lesson with the critic-teacher, the critic-teacher sees each lesson taught, and the student-teacher is not permitted to make final plans for the next lesson until the previous one has been criticized and discussed.

The Housekeeper Course.

Ten entered the course in September, 1909; seven passed on to the senior class of September, 1910, one entered by virtue of Homemaker work, and a member of an earlier class returned to complete her course; eight passed the final examinations of June, 1911, and have received the Macdonald Institute Certificate. Thirteen entered the course in September, 1910; eight passed on to the senior class, and a member of an earlier class returned in September, 1911, making nine now in attendance. Thirteen entered the course last September.

The demand for trained housekeepers is far ahead of the supply. We recognize that Canadian housekeeper training is in its infancy, but it is a lusty infant, and we hope that its development will be steadily encouraged. We have begun to apply the selection principle to this course, and in future, as experience tests those chosen, we expect the quality of the class to strengthen.

Following are some of the positions to which our housekeeper graduates have been appointed in 1911:

Name.	Class of	Appointed to
Miss J. G. Allan	1907	General Hospital, Calgary, Alta.
" J. Blyth	1910	Asylum for Insane, Mimico, Ontario.
" M. Carrick	1911	Mount Royal College, Calgary.
" M. Davidson	1910	Brandon College, Brandon, Man.
" J. Elliott	1911	Galt Hospital, Lethbridge, Alta.
" W. Frank	1911	Riverdale Hospital, Toronto, Ont.
" L. Howell	1911	Natchez Hospital, Natchez, Miss., U.S.A.
" M. Murdoch	1910	General Hospital, Toronto, Ont.
" M. Rutherford	1909	Simmons College, Boston, Mass., U.S.
" E. Shand	1907	Asylum for Insane, Toronto, Ont.
" M. Smellie	1910	Macdonald Hall, O.A.C., Guelph, Ont.
" E. Tennant	1905	University of Saskatchewan, Saskatoon, Sask.

The Homemaker Course.

Forty-five entered this course in September, 1910; thirty-three passed the final examinations last June and have been awarded the Macdonald Institute Homemaker Diploma. Twenty-four were admitted to the course last September and are now in attendance.

The rule of giving preference to farmers' daughters up to sixty days before the course opened, found us at the middle of July with the class filled with farmers' daughters and a long list of others who had to be refused.

Hitherto the Homemaker Course has opened only in September, and many girls anxious to enter were prevented because they could not be spared from home

at the beginning and end of the summer. We are now opening a Homemaker class each term, and it is possible that some of these girls may be encouraged to take one term, drop out for a time and return later to complete the course. We have had applications enough for January 1912 to fill the class twice over, but the lack of residence accommodation prevents much expansion, except at the expense of the short courses.

The Short Courses.

The Short Courses in Domestic Science had in attendance in the

Winter term from	January to March	33
Spring "	April to June	23
Autumn "	September to December	37

The Short Course in Sewing had in attendance in the

Spring term from	April to June	6
Autumn "	September to December	11

Optional Courses.

Optional students are almost ruled out by the fact that special classes cannot be arranged for them, and the full time students leave few openings in their classes for them. There were five in the winter, four in the spring, and four in the present term.

An evening class in shirtwaist making was held last winter with nineteen in attendance. The distance from town is too great, and the demand for such classes not great enough to warrant further classes at present.

The Summer Course in Domestic Science.

The usual Summer Course was held with twenty-six in attendance. Miss Edna Ferguson had charge of the cookery instruction, Miss Allan of laundry and sanitation, and Dr. Ross of home nursing and hygiene.

Student Workers.

Six girls have taken advantage of the student-worker agreement which enables a girl to pay for a Macdonald Institute course with her own labor. One is giving a year's service preparatory to a Homemaker Course, and five have given four months' service in return for Short Courses. They find the training under the Hall housekeeper admirable preparation for the instruction in the Institute classes.

Special Lectures, Meetings, Etc.

Mr. Hales, of Guelph, gave three excellent lectures upon Meat, illustrating them practically by cutting up a side of beef before the classes, while he explained the quality and market value of the different cuts. We have arranged for a lecture upon similar lines on the subject of Home Furnishing, when the illustrative material will be draperies, etc., from the open market.

The Senior Normal and Housekeeper classes paid the annual visit to the Berlin factories of the Beet Sugar Co., The Merchants Rubber Co., The Williams, Greene & Rome Co., and the Button Factory.

This department was represented at the Ontario Education Association; the recent Women's Institute Convention in Toronto and the Wellington County Women's Institute Convention. Miss Tenant and several other graduates with myself, attended the Institution Management Convention, held at Lake Placid, in New York State. This was only the second convention of the kind, and was remarkable as an evidence of rapidly increasing interest in the question of special training for institution household administration.

Last year's reorganization of the waitress-training for our students has proved successful. The training has the full respect of the students, has already become part of the routine work of the courses, and is carried on in connection with the girls' residence without disturbance to classes or Hall administration.

Women's Institute Work.

The work of putting our library pamphlet material at the service of the members of the Women's Institute, continues, and is apparently much appreciated. The pamphlet collection has been improved by replacing weak or out of date material with later and better pamphlets, which enables us to satisfy requests with fewer folders. The following lists show the variety of information wanted and the mass of material sent out. The increasing interest in Social Service and community affairs is notable.

Requests for information on

Home interests	69
House and Housekeeping	48
Food and Cookery	155
Dietetics	34
Health	43
Household Finance	11
Home Economics Education	12
Clubs, Social Service, etc.	161
Gardening	14
Miscellaneous	94
Total	641

Requests answered with

1,860 folders with pamphlets, magazine articles or clippings.
53 books,
55 special letters of information,
16 letters regretting that material wanted was already out on loan,
39 letters regarding subjects not dealt with by our collection.

We have referred many questions to other departments of the College better able to answer than this, and have always had their cheerful co-operation.

This work is valuable not only as a means of helping the Women's Institute and of bringing many rural districts into touch with the extent and resources of the College, but as a means of bringing much valuable material in current magazines and reports to the notice of the teaching staff. The clerical labor involved is great, and the present arrangement of having it done by a temporary clerk without Home Economics training, is unsatisfactory. It should be done by a permanent secretary who could do the necessary cataloguing.

At the request of the Superintendent of Women's Institutes this department aided in the work of launching itinerant teaching, who is carrying on a four months course of weekly lessons in six different centres in Haldimand County. This itinerant teaching is most successful, and we can see in it the possibility of a mighty movement.

Staff Changes.

Miss Allan, who has been our efficient laundry and sanitation teacher ever since her graduation in 1907, resigns her position this year. Miss Georgina Walsh, a graduate of last year, has been secured to fill the position.

Miss Tennant, housekeeper of Macdonald Hall, and one of our early housekeeper graduates, has left us for a position in the new University of Saskatchewan. She gave this department much assistance in organizing and supervising our present effective use of Macdonald Hall as a field of practice, and recent housekeeper classes owe much to their study of her methods and organization. We have been fortunate in finding her successor in Miss Margaret Smellie, a housekeeper graduate of 1910.

Dr. Annie Ross has rejoined the staff after a year's leave of absence.

Equipment, Etc.

The outstanding need of this department is more room. First, more residence room. The parents of this Province will not send young daughters to board alone in the city of Guelph, and they are wise. In consequence waiting lists are the chief features of our application files. During the past year, after filling all vacancies caused by accepted students dropping out, there still remained 152 students who could not be accepted for want of room. At the present moment we have on file 237 applications for admission to classes opening in 1912. During the past year we have reserved the non-professional classes to the farmers' daughters until within sixty days of the term's opening. Now even the farmer's daughter must get her application filed three months ahead, or take chances of refusal. When it is considered that the residence revenue nearly balances the cost of maintenance, it would seem the part of wisdom to make residence additions promptly.

The Home Economics classes are also beginning to suffer for want of Macdonald Institute rooms used by various departments for men's classes and offices. Certain cherished plans for enriching the Homemaker Course have had to be given up until such time as the men's classes are provided for elsewhere. We shall secure the rooms eventually, but the waiting-time seems long.

We are finding it difficult to handle our library under the present system. The number of books is increasing, and the student population changes so rapidly it is impossible to keep track of the books taken out, without having them in charge of some one person. The books are in constant use, and the convenience of having the library is too great to forego. We have noted above the unsatisfactory condition of the clerical work for the Women's Institute, and we therefore recommend the appointment of a permanent secretary with Home Economics training, to have charge of the library work and the pamphlet loan collection.

Respectfully submitted,
MARY URIE WATSON.

PART XVII.

THE PROFESSOR OF MANUAL TRAINING.

To the President of the Ontario Agricultural College:

SIR,—I have the honour to submit herewith my eighth annual report on the work of the department of Manual Training and Farm Mechanics for the year 1911.

The courses of instruction offered by this department are:

1. Normal Course in Manual Training.
2. Woodworking and Drawing—First Year students attending the agricultural Course.
3. Metalworking and Farm Mechanics—Second Year students attending the Agricultural Course.
4. Plain Carpentry for students of the Macdonald Institute.
5. Color and Design for students of the Macdonald Institute.
6. Special Three Months' Course in Industrial Arts for Students from the Normal Schools of the Province.

Work of students of Summer School, 1911.

The work prescribed for each of the above courses is outlined in the College Calendar and in syllabuses issued for the different courses, and therefore need not be repeated here. The services of Miss Long for instruction in Art and Construction work to the Spring Course students in Industrial Arts and to the Summer School students were again available. We were also able to secure Mr. R. W. Moffatt, B.A. Sc., to give instruction in Mechanical Drawing during the Spring Course and Summer School. Professor Wade again came forward and relieved us of a division in Farm Mechanics during the fall term.

Winter Term.

Lectures and practical work were given in Woodworking and Drawing to 107 First Year Agricultural students, Color and design to 36 Macdonald Institute students, Plain Carpentry to 9 Macdonald Institute students, Forging to 7 Normal students.

Spring Term.

The Industrial Arts Class. This class was not so large as either of the classes of the two previous years. The proportion of male students was again very low. There were only three men to fifteen women. All the Normal Schools of the Province being represented.

No.	Name.	Post Office.	County.	Normal School.
1	Abraham, E. Ella	Chatham	Kent	Stratford.
2	Clubine, Israel	Ringwood	York	Peterboro'.
3	Cornett, F. W	Gananoque	Leeds	Ottawa.
4	Forster, Vida A	Galt	Waterloo	Ottawa.
5	Harman, Stella	Woodstock	Oxford	London.
6	Hurlburt, Katie	Mitchell	Perth	Stratford.
7	Johnson, Marjorie M.	Bracebridge	Muskoka	North Bay.
8	Jull, Nellie	Norwich	Oxford	Hamilton.
9	Lett, Estella E	Eganville	Renfrew	Ottawa.
10	Macdonald, Cassie	Lucknow	Bruce	Stratford.
11	Main, Pearl	Renfrew	Renfrew	Ottawa.
12	McLean, Jean	Teeterville	Norfolk	Hamilton.
13	Metcalfe, Geo. A	St. Thomas	Elgin	London.
14	Moriarty, John A	Newboro'	Leeds	Ottawa.
15	Patterson, Elva J.	Bothwell	Kent	London.
16	Tuttle, Katie	Stratford	Perth	Stratford.
17	Whiteman, Mabel G.	Berlin	Waterloo	Stratford.
18	Hall, H. L.	Woodstock	Oxford	London.

The course covered a little more ground in Drawing than was done in the two preceding years, and I am glad to say without any perceptible loss of quality in the work. A synopsis of the Drawing is given here:

MECHANICAL DRAWING.

Synopsis:

The use and care of the instruments.
Construction of scales.
Single-stroke letters; Capital and lower case letters.
Single-stroke numerals.
T-square and triangles combinations.
Conventional lines in mechanical drawing.
Orthographic projection.
Application of orthographic projection—type solids, etc.
Axonometric projection.
Isometric drawing.
Oblique drawing.

Conic sections:—
(*a*) The ellipse.
(*b*) The parabola.
(*c*) The hyperbola.

Construction of an ellipse—different methods.
Industrial design.
Designs for borders, oilcloth, etc.

Working Drawings:—

I. Planning the drawing:—
  (*a*) The scale.
  (*b*) The number of views.
  (*c*) The arrangement of views.

II. Dimensioning:—
  (*a*) Forms of dimensions.
  (*b*) Necessary dimensions.
  (*c*) General system of placing dimensions.
  (*d*) Positions of dimensions for clearness.
    Extension lines.
    Dimension lines.
    Visible lines.
  (*e*) Invisible lines.
    Centre lines.
    Shaded lines.

III. Sectional hatching—Indication of materials.
IV. Working Drawings of Models.
V. Working Sketches.
VI. Tracings, Blue-printing, and Flat-washes.

All the members of the Class were successful in obtaining the certificates in Industrial Arts issued by the Department of Education. This certificate entitles the holder to an additional annual grant of $30.00, provided the instruction in Industrial Arts is given in public or separate schools of villages and towns, in accordance with the regulations of the Department of Education.

Other students in attendance during this term:

Normal students	7
Woodworking	3
Colour and Design	7

The Summer School.

The attendance at the Summer School in July showed a marked increase in the number of students over any of the preceding years. There were in all sixty-eight. The work was taken up by the various members of the school, as set forth in the accompanying list:

Woodworking and Mechanical Drawing:

1. Cornell, D. N., Cornwall.
2. McWilliams, J. J., Elora.
3. Mann, W. S., Toronto.
4. McKillop, Tena, Miss, Eagle.
5. Moffatt, W. J., Dungannon.
6. Moffitt, Mary, Miss, Cape Croker.
7. Mott, U. W., Belleville.
8. Ingram, H. L., Belleville.
9. Styles, Arthur, Brantford.
10. Traver, Delos, Binbrook.
11. Brown, J. W., R.R., No. 4, Guelph.
12. Carter, J. J., Ottawa.
13. Bailey, A. M., Toronto.
14. Hamilton, T. R., Winterbourne.
15. Walkom, Wm. S., Perth.
16. Hoffered, G. W., Lucan.
17. Clubine, Israel, Ringwood, York.
18. Baker, Miss L. J., Fort Albany, James Bay.

METALWORKING, ETC.:

19. Crowson, Arthur, Ottawa.
20. Phelan, F. J., Consolidated School, Guelph.
21. Snider, W. W., Moose Jaw, Sask.
22. Powers, J. T., Queensville, York Co.
23. Kiernan, A., Wallbridge, Hastings Co.
24. Ferguson, W. T., Smith's Falls, Lanark.
25. Tebbutt, Chas., Clinton, Huron.
26. Close, J. O., Woodstock, Oxford.
27. Slaughter, E., Guelph.
28. Forrester, T. C., Strathroy.
29. Chambers, J. E., North Bay.

ART AND CONSTRUCTIVE WORK:

1. Abraham, Mary B., Chatham.
2. Auld, J. H., Guelph.
3. Beattie, Ethel L., Campbell's Cross.
4. Brown, W., Mrs., Hampton.
5. Card, Ida B., Marden.
6. Clyde, Lavina, Chatham, Kent.
7. Coverdale, Estella, Canfield.
8. Clark, L. A., Sarnia, Lambton.
9. Crookshanks, Eva, Rednersville.
10. Cunningham, Minnie A., Port Albert, Huron.
11. Du Cuerre, Jessie I., Sudbury.
12. Eberhardt, Mary A., St. Catharines.
13. Feeney, Nettie, Madoc, Hastings.
14. Findlay, Eva, Haileybury.
15. Gove, Blanche, Vineland.
16. Hawkins, E. T., Listowel.
17. Henry, Helena, St. Catharines.
18. Knox, Sylvina, Swinton Park, Grey.
19. MacPherson, K. M., Merton.
20. MacBeath, Margaret, Madoc, Hastings.
21. McCulloch, E., Perth.
22. McKinlay, Margaret, Sarnia, Lambton.
23. McNab, E. M., Guelph.
24. Matthews, Alice M., Sarnia.
25. Melburn, M. C., Belleville, Hastings.
26. Meredith, Carlotta E., Toronto.
27. Morgan, M. C., Hamilton.
28. Robins, Lilian, Jordan Harbour.

29. Saunderson, J. F. W., Madoc.
30. Scott, Enith, Bervie.
31. Sitlington, E. A., Sarnia.
32. Stanley, Hattie J., Balderson.
33. Stein, L. M., Belleville, Hastings.
34. Stevenson, Mary, Strathroy.
35. Wilcox, A. E., Hamilton.
36. Wright, A. Amy, Alliston.
37. Yokom, Laura, Welland.
38. Wright, Evelyn P., Port Colborne, Welland.
39. McKinlay, Janet, Aberader, Lambton.
40. Lawson, Miss E., Streetsville, Peel.

The Normal Class in Manual Training.

The following gentlemen entered upon their full course in Manual Training in the Fall of 1910. A few of them had been in attendance at Summer Schools and have now given up their positions to complete the Course:

Mr. Chas. Tebbutt, Clinton, Huron.
Mr. T. J. Power, Queensville, York.
Mr. Thos. W. Davidson, Camborne, Northumberland.
Mr. A. Kiernan, Wallbridge, Hastings.
Mr. J. O. Close, Woodstock, Oxford.

Entered January, 1911:

Mr. W. T. Ferguson, Smith's Falls.
Mr. Edward Slaughter, Guelph.

Entered September, 1911:

Mr. Israel Clubine, Ringwood, York.
Mr. J. W. Moffatt, Narva, Bruce.
Mr. Norval McKim, Springford, Oxford.
Mr. J. R. Sayers, Cherry Valley, Prince Edward.
Mr. F. J. Phelan, Chepstow, Bruce.
Mr. W. M. Flumerfelt, Guelph.

Mr. T. W. Davidson was a student of the Industrial Arts Course in 1910. He completed his prescribed work last June and wrote off the remaining examinations. He was awarded the Manual Training Certificate issued by the Department of Education, also the College Certificate granted to students who have completed the twelve months' course. Mr. Davidson was appointed Manual Training Instructor at Brockville, Ont. Of the 1910-11 class the following students have secured positions, but have not completed the prescribed work required for the certificate issued by the Department of Education, though they have qualified for the college certificate in Manual Training and have received the same:

Mr. Tebbutt is appointed to take charge of Manual Training at Stratford. At present he is continuing his work here.

Mr. Power has charge of the Manual Training Instruction of the Public Schools of Guelph.

Mr. Kiernan has been elected on the Manual Training staff at Regina.

Mr. Slaughter has gone West to fulfil a position in one of the schools at Nutana, Sask.

Mr. W. T. Ferguson, previous to his entering for the full course work, had attended Summer Schools. He finally completed the course in July, was granted the College Certificate and recommended to the Department of Education for the certificate in Manual Training. Mr. Ferguson is on supply at Stratford. He

eventually returns to Smith's Falls in the capacity of Manual Training Instructor.

Mr. Flumerfelt has been engaged as Manual Training Instructor at the Collegiate Institute, Owen Sound. He has completed the practical work of the course, but has not presented himself for examinations to qualify for the certificate issued by the Department of Education. The certificate granted by the College to students who have completed the twelve months' course has been given to Mr. Flumerfelt.

Mr. Close is, at the present time, pursuing his studies here.

In addition to these students, there were in attendance during the fall term:

115, Second Year Agricultural Students for Farm Mechanics and Forging.
34, Colour and Design.
7, Plain Carpentry.

Machinery Hall.

Donations of farm implements for Machinery Hall have been received from:

The Canadian Gate Co., Guelph, one "Stock Proof Farm Gate" and one "Walk" Gate.

The Aspinwall Co., Guelph, one Handsprayer.

The New Idea Manure Spreader Co., Coldwater, Ohio, one Manure Spreader.

The Massey Harris Company have replaced last year's models of the Side Delivery Rake, and of the Binder, with machines having the latest improvements.

The following firms have withdrawn some of their exhibits from the "Hall."

The Frost and Wood Co., Smith's Falls, Ont., one Binder.

The Smith Cultivator Co., Listowel, Ont., one cultivator.

In conclusion, I thank you for the generous help accorded me, and to bespeak earnest consideration for the need of the department as set forth in the early part of this report.

I have the honor to be, Sir,

Your obedient servant,

JOHN EVANS.

PART XVIII.

THE PROFESSOR OF FORESTRY.

To the President of the Ontario Agricultural College:

Sir,—I have the honour to present herewith the report of the Forestry Department for the year 1911.

The work of this department during this last year has been largely concerned with the propaganda of re-foresting, the co-operative planting and the reclamation of waste land, along with the development of the forest nursery at the Norfolk Forest Station.

Planting White Pine on open waste portions of the Norfolk Forest Station by University of Toronto Forest School students.

Norfolk Forest Station.

Nurseries. The forest nursery this year has produced a very good lot of material, although we had some very dry weather. There is at present in the nurseries about 928,000 plants in nursery lines, and 1,100,000 evergreen seedlings in seed-beds. The following is an approximate estimate of the nursery stock:

In Nursery Lines.

White Pine, 4 years old	80,000	Butternut, 1 year old	13,000
" 2 & 3 "	358,000	Sweet Chestnut, 2 years old	30,000
Scotch Pine 2 "	250,000	Soft Maple, 1 year old	16,000
" 3 "	10,000	Elm, 1 year old	5,000
Jack Pine, 3 "	3,000	White Ash, 2 years old	15,000
Spruce, 4 years old	40,000	" 1 "	20,000
White Cedar, 3 years old	10,000	Red Oak, 1 "	20,000
Black Locust, 1 "	25,000	Miscellaneous	25,000
Black Walnut, 1 "	24,000		

In Seed-beds.

White Pine, 1 year old	400,000	White Spruce, 1 year old	75,000
" 2 "	300,000	Yellow Pine (*P. ponderosa*)	25,000
White Cedar, 1 & 2 years old	200,000	Miscellaneous	10,000
Larch, 1 & 2 years old	80,000		

Additional Seed-beds.

In addition to the above plant material grown we have this autumn sown the following seeds:

60 lbs. of White Pine.
30 " Red Pine.
25 " Scotch Pine.
20 lbs. of European Larch.
30 " " Arbor Vitæ or White Cedar.

Forest planting on the watershed above the springs supplying the City of Guelph with water.

We have found that the autumn seeding gives very early germination resulting in strong plants which resist the enemies so prevalent in evergreen nursery work.

Experimental Planting.

This season some 200,000 plants of White Pine and Chestnut were put out on the waste portions of the headquarters' property. Fall planting of White Pine has been carried on to obtain the comparative value in relation to spring planting which is usually followed.

Co-operative Planting.

During the last season about 350,000 plants were sent out to applicants, consisting largely of White Pine, Scotch Pine, White Ash, White Elm, Sugar Maple,

Soft Maple, Catalpa and Black Locust. A number of planters received Black Walnuts, Butternuts and Shagbark Hickory nuts, to be used in planting in wood lots or plantations.

The results of earlier plantations are beginning to be felt. Correspondence is beginning to come inquiring after the nature of our work, owing to the fact that the correspondent has seen some of our earlier plantations which are now getting to be three and four feet in height. The growth during the first few years in a forest plantation is slow and not very striking, but after the trees once establish themselves a more rapid growth begins, and then the educational value of this work must be felt.

Under the direction of the Schools' Section of the Experimental Union, there were distributed fifty collections of forest tree seedlings. These seedlings are used in school gardens or for planting in some suitable place about the school grounds.

Three year old plantation of White Pine made to fill in waste portion of woodlot at the Ontario Agricultural College.

Woodland Conditions in Older Ontario.

The improvement of woodland conditions in the old settled parts of Ontario is one of the problems confronting us. To many it may seem peculiar that in Eastern Canada, which has the reputation of being a forest country, there are to-day methods being employed to reforest. That part of Ontario which lies south-west of the proposed Trent Valley Canal contains twenty-seven counties with a total assessed area of 20,000 square miles. 125 years ago this was an almost unbroken forest, to-day there is less than 9 per cent. of forest land within this area, and much of this could scarcely be called forest. A number of counties have below 6 per cent. of forest land.

To realize our position I would have you compare this southern hardwood region of Canada with that of two other States. Southern Ontario has 20,000 square miles with 9 per cent. of inferior woodland, yielding but small revenue. Saxony, with 5,789 square miles of land area, has 27 per cent. of forest land, which yields an annual revenue of 2,299,000 dollars. Prussia, with 10,420 square miles of land area, about one-half the size of Southern Ontario, has 23.5 per cent. of forest land, which yields an annual revenue of 17 million dollars.

Second growth White Pine on land in the Norfolk Forest Station.

The private woodlands or woodlots, which largely go to make up the 9 per cent. referred to in my previous estimate, will scarcely improve. I am inclined to think that in general they will deteriorate. If Southern Ontario is to have any forest left it must be by protecting the remnants left on the non-agricultural soils, and re-planting where necessary.

There are at least 200 square miles of unproductive sand lands within this southern agricultural portion of Ontario, which could be obtained at a low cost. These lands in many cases would produce hardwoods, as Chestnut, Red Oak, Locust, and Ash. It is not of vital importance that these lands be re-forested only, but that hardwoods, wherever possible, be planted. Canada's future hardwood supply

is going to be a serious problem. To-day it is coming largely from the United States, but this source will gradually disappear.

The policy of re-foresting our waste land has many arguments in its favour. It will pay as a financial investment, assist in insuring a wood supply; protect the

Coppice of Chestnut, one of the most valuable hardwoods growing on the poorer soils.

headwaters of streams; provide breeding ground for wild game; provide object lessons in forestry, and prevent citizens from developing under conditions which can end only in failure.

Respectfully submitted,

E. J. ZAVITZ.

PART XIX.

THE LECTURER IN APICULTURE.

To the President of the Ontario Agricultural College:

SIR,—Another year has passed and I am able to report good progress in my third annual report.

The College work of last year was increased by the addition of some lectures to the Second Year and Third Year Classes. A Beekeeping Short Course in May, was well attended. Extension work, such as lectures at conventions, and answers to questions by mail, occupied a fair share of the time and developed some new features. These are Bee Institutes, Apiary Demonstrations, Bee Demonstrations at Fall Fairs, the employment of college students to assist in demonstrating and inspecting, and a more centralized administration of the Foul Brood Act. Some new experiments were added to the co-operative work of the Experimental Union. The college apiary was increased to forty-five colonies, and a small crop of honey harvested in spite of the extremely poor season. Bulletins, magazine articles, and reports were published from time to time during the year.

THE COLLEGE WORK.

Two lectures per week were given to the First Year Students during the Fall term. Owing to the size of the class practical work was confined to the individual experience gained while doing "student labour." An outline of external anatomy was taught by means of freshly-killed specimens distributed to the class, who examined them with pocket lenses and made drawings of the principal parts. Internal anatomy was confined to general information on the digestive and reproductive systems, with a special discussion of Dzierzone's Law of Parthenogenesis. The principles underlying the main problems of management, also the diseases to which bees are subject, were fully discussed, with special reference to the Ontario Foul Brood Act, and how it is administered.

In the Second Year and Third Year lectures the life history of the bee was reviewed, and a more thorough study of the anatomy taken up, using as text-book a most excellent bulletin recently prepared by R. E. Snodgrass, of the U. S. Division of Apiculture. Most of these lectures were illustrated with lantern views, and received the close attention and hearty appreciation of the students.

The interest taken in the subject was indicated by an increased membership in the Apiculture Club, also by the fact that Second and Third Year students retained their membership although practically no examination obligations were involved. Several students came back from a season's employment in practical beekeeping and apiary inspection full of enthusiasm for beekeeping as a business. One even bought bees and a location during the summer, so as to have a business ready for him on graduation.

THE APICULTURE CLUB.

This organization is the outgrowth of a desire on the part of some of the students for more bee lectures and demonstrations than the curriculum provides for. During the college year regular meetings were held fortnightly, and were well

attended, as the membership was over one hundred students. At some of the meetings illustrated lectures and demonstrations of a more advanced nature than the First Year work were given by myself. At others members of the club who had inspected bees or worked for beekeepers during the summer related their experiences. Prominent beekeepers from different parts also came from time to time to address the club. This pleasant method of obtaining apicultural knowledge will help the members to become better beekeepers, apiary inspectors, or district representatives after they graduate from this college.

The May Short Course.

The interest taken by beekeepers all over the Province in this, the first course of its kind ever held at the Ontario Agricultural College, far exceeded all expectations. In all, forty-three bee enthusiasts were in attendance, including eight regular apiculture students of Macdonald Hall, and six other ladies, from different parts of the Province. The counties represented in the entire attendance were the following: Bruce, Carleton, Dufferin, Elgin, Haldimand, Kent, Lambton, Leeds, Lincoln, Middlesex, Perth, Stormont, Welland, Wellington, Wentworth, and York. The programme consisted of forenoons devoted to lectures and afternoons to demonstrations and practice. The weather being cold most of the week, the practical work took the form of demonstrations in the laboratory, doing such work as rendering wax from old combs, and nailing up hives, frames, etc. An exhibit of different kinds of combs, hives and implements used by beekeepers, attracted much interest. By Thursday it was warm enough to visit the apiary. The hives were still in the boxes where they had been packed with planer shavings for winter. These boxes were taken off by members of the class and stacked, the shavings were removed, and the class was given a drill in handling combs with the bees on them, and looking for different conditions of the internal economy of the hive. Friday afternoon was spent in a similar way, giving more attention to the symptoms of American Foul Brood. Saturday morning, local apiaries were visited, and some members of the class became discoverers of real cases of disease, much to their own satisfaction.

Many thanks are due Dr. E. F. Phillips, Ph.D., in charge of Apiculture for the United States, also the members of the teaching staff of this college, whose lectures on the subjects assigned them added greatly to the success of the course.

As May is rather a busy season, and no special railroad rates can be secured at that time, it has been decided to hold the next course January 9-20, 1912, at the time of the other short courses. These dates have been advertised, and a large attendance is expected.

Bee Institutes and Conventions.

In January, at the request of Mr. G. A. Putnam, Supt. of Institutes, I attended some Farmers' Institutes in West Elgin and Middlesex. While lectures on bees were appreciated by a number of those present, it was evident that one who speaks on bees, at general institute meetings, should have other subjects as well. On the other hand, purely bee institute meetings arranged for by the agricultural representatives in Hastings and Northumberland during February were enthusiastically received with an average attendance of twenty-five, some of whom drove fifteen miles to attend. An association was organized in each of these counties with the district representative elected secretary. I also attended regular county conventions in Brant, Huron, Leeds, Oxford, Simcoe, Welland, and Wellington. New

county associations were organized in Hastings, Huron, Leeds, Northumberland, Lincoln, Welland, and Wellington. There are now seventeen county beekeepers' associations in Ontario.

Apiary Demonstrations.

In addition to these regular meetings I held apiary demonstrations in the following counties: Brant, Carleton, Elgin, Glengarry, Hastings, Northumberland, Prescott, Russell, and York, with an average attendance of forty. Other demonstrations were conducted by apiary inspectors and others under the direction of this department, and with the assistance of the local associations, bringing the total number of apiary demonstrations up to twenty-seven meetings held in seventeen different counties. They were remarkably well received by beekeepers everywhere, the average attendance at all meetings being about thirty, and everyone was enthusiastic over this method of instruction.

The success of apiary demonstrations depends on the location, the date, the advertising, the demonstrator, and last, but not least, the weather. In most cases we were able to choose an apiary easily accessible to a number of beekeepers, where the owner was sufficiently interested to talk up the meeting among his neighbours. Then notices were mailed from this office to the local beekeepers whose names we had, to the editors of newspapers, postmasters, general merchants, and blacksmiths, announcing the place, date, and nature of the meeting to be held, and requesting them to give it all the publicity they possibly could. With the kindly assistance of these different persons the meetings were widely advertised. Where possible the local inspector was advised to examine the bees of the neighborhood during the week previous, and take the opportunity to explain the benefits of attending such a demonstration. This also enabled him to learn local conditions, and meet them while demonstrating. Towards the end of June, farmers were found to be too busy to turn out in large numbers, and occasional rainy days showed how dependent we were on weather conditions.

Trained Inspectors.

Another feature of the year's work was the employment for the first time of college men as apiary inspectors. The necessity for making some change has been evident for several years. Our best inspectors have been dropping out from year to year because they found it more profitable to look after their own bees than to go out in the busy season and attend to their neighbors' bees. It has been very difficult to fill their places and supply the demand for more inspectors with competent men. At the same time there are bright men in our classes who are specializing in beekeeping. They are here where we can give them special training, and they have their summer free to devote their whole attention to the work. Having no established business which must be neglected when they go inspecting, they do not require so high a wage for their time. Their expenses are also materially reduced by using the college rate of one cent per mile on the railroads. The employment of three college men during the season of 1911 has shown that the plan can be worked with good success.

Demonstrations at Fall Fairs.

The demonstrations in handling live bees at the Canadian National Exhibition and the Western Fair were this year ably conducted by college men, who had been inspecting apiaries during the season. These men also, under arrange-

ments made by Mr. J. Lockie Wilson, Supt. of Agricultural Societies, took their bees and demonstrating outfits to Fall Fairs at Alexandria, Renfrew, Peterborough, and Oakville. At Picton, Simcoe, and Warren fairs demonstrations were conducted by myself. It was gratifying to see the amount of interest in, and the natural possibilities for, beekeeping, everywhere we went, even in the neighbourhood of Sudbury, where Warren is located.

Administration of Foul Brood Act.

The administration of the Foul Brood Act of Ontario has been largely turned over by the Fruit Branch to this department.

The office work which began during the winter of 1910-11, consisted in copying reports of inspection of 1910 on the individual cards of the beekeepers in the card record, also filing the original reports by counties and townships for easy reference to individual cases when necessary. This required considerable attention during the whole winter, but the result is very valuable in directing future inspection work. Early in the spring a circular letter was sent to nearly five thousand bee-keepers warning them of the danger of spreading disease by robbing, and advising all owners of bees dwelling in box hives to make preparations for transferring all such into modern hives during the swarming season.

The publication of Bulletin 190, on Bee Diseases, which was sent to 5,000 beekeepers, and the Short Course for Apiary Instructors held in May, were important factors in the administration of the Act, and are reported elsewhere. During the summer an effort was made to personally supervise the work of the sixteen local inspectors, but the lack of competent office help made this practically impossible. It is to be hoped this handicap will be removed before another season, as efficient work will never be done so long as each local inspector is largely a law unto himself.

The inspection season was marked by a greater interest on the part of beekeepers and inspectors than ever before; 1,013 apiaries in all were visited by inspectors, and as many of these were visited a second time, the number of visits made to apiaries by inspectors would be much larger than this. Out of this number, 414 apiaries were found diseased. These apiaries averaged about 20 colonies each in size. As the inspectors had special instructions, on account of the limitations of the appropriation for this work, to visit only apiaries where disease was strongly suspected, we are by no means to infer from these figures that 40 per cent. of the apiaries in Ontario are diseased.

The principal feature of the disease situation is the rapid spread of European Foul Brood in Carleton, Russell, Renfrew, Northumberland, Hastings, Prince Edward and Welland. The only sure remedy for this disease is the introduction of well-bred Italian queens, in addition to the careful use of the shaking treatment, the same as is used for American Foul Brood. We are planning to hold Bee Institutes during the present winter, and additional apiary demonstrations next summer in these and adjoining counties. Persons interested in having such meetings held in their neighbourhood should correspond with this Department.

Co-operative Experiments.

Under the auspices of the Agricultural and Experimental Union, co-operative experiments in the Prevention of Natural Swarming were continued. To this was added experiment No. 2, The Prevention of Natural Swarming in the Production

of Comb Honey. Several experiments in races of bees were also sent out. All of these will be reported fully in the Annual Report of the Experimental Union.

The Apiary.

As there are only twenty-four hours in the day, and the amount of work one man can accomplish depends on the amount of competent help he has, apiary work was largely crowded out by other work of more importance to beekeepers at large. It is hoped that as apiculture students are being trained the time will soon come when valuable experimental work can be taken up. In the meantime the bees are increasing and bringing in some honey. Visitors are pleased to find that there is a college apiary: but remark that it would be greatly improved by having a suitable building for apiary work.

Publications.

During the year I prepared the following for publication:

First, "Results of the Co-Operative Experiments on the Control of Swarming," published in the Thirty-second Annual Report of the Ontario Agricultural and Experimental Union, 1910.

Second, Bulletin 190, "Bee Diseases in Ontario," being a revision and enlargement of the pamphlet used by apiary inspectors for distribution among bee-keepers while on their rounds. This bulletin was sent in May to the mailing list of five thousand beekeepers in Ontario, and also distributed during the summer, by inspectors, among those who had not yet received it. This free distribution of literature is found to be a great help in the educational campaign which forms a great part of our fight against Foul Brood.

Third, Bulletin 191, "Bee-keeping in Ontario," being a detailed report on the honey prospects in the various counties, compiled from reports sent in May, by six hundred beekeepers, living in different parts of Ontario.

Fourth, "Natural Swarming and How to Prevent it," being a pamphlet issued by the Experimental Union for the use of co-operative experimenters. This was also assigned to take the place of the chapter on Swarm Prevention in the text-book for class use.

Fifth, Annual Reports on "The Inspection of Apiaries in Ontario," also "County Organizations and Their Work," both published in the annual report of the Ontario Beekeepers' Association.

Sixth, Sundry articles and answers to questions published in the Bee Journals and Farm Magazines from time to time during the year.

The Honey Industry in Ontario.

In May, 1911, six hundred beekeepers in Ontario reported on the condition of their bees and the prospects for honey. The total number of colonies reported for the Fall of 1910, was twenty-three thousand seven hundred and thirty. For May, 1911, it was twenty thousand four hundred and fourteen. This represented a winter loss of fourteen per cent., which was five per cent. more than the year previous. This also meant that the remaining colonies were weaker in proportion, and were less fit for the work of gathering honey. On the other hand the condition of clover was reported almost uniformly good.

While a Spring report is of value in determining the honey crop, there is no other farm crop so entirely dependent on weather conditions from day to day during harvest time. Any sudden change will often check the secretion of nectar in the flowers and reduce the expected honey crop by hundreds of thousands of pounds. This was proven during the past year when the unusual heat and drouth practically ruined the honey crop in many parts of Ontario. In spite of this the average yield per colony was more than five dollars' worth of honey, which is not a bad profit, compared with other branches of farming.

By the latest information at hand it is estimated that the annual honey crop in Ontario is worth, at market prices, $1,500,000, and that 10,000 persons, from Point Pelee to the Cobalt regions, and farther North, are engaged in the business of producing it, keeping 300,000 hives of bees for the purpose. Even then, I venture to say, not one-quarter of the nectar secreted by Ontario flowers is ever utilized. And not one-tenth of the honey is consumed in Ontario homes that our people are capable of eating. When the parents of growing families buy a five pound pail of honey as a winter's supply, to be "kept for colds," then stock up with unwholesomely rich preserves and pastries for table use, there is surely a large field for advertising.

I believe that this department can and does benefit the people of Ontario at large by calling the attention of the student body of this college to a branch of agriculture which has greater possibilities of development than any other, by teaching them and the bee-keepers generally methods of management by which larger quantities of honey can be placed on the market, and by teaching the general public that honey is nature's purest and most wholesome sweet, meant for table use three hundred and sixty-five days in the year.

MORLEY PETTIT.

PART XX.

THE RESIDENT MASTER.

To the President of the Ontario Agricultural College:

SIR,—I have the honour to submit my report, as Resident Master and Instructor in English, for the year 1911.

Affairs in the residence have preserved a satisfactory character. The dormitories accommodate 213 persons, of which 125 are students in their First Year, 51 are in the Second Year, 25 in the Third Year, and 9 in the Fourth Year. Accommodation is also provided for the Assistant Dean, the Secretary, and the Instructor in Athletics.

The general health of the students this autumn term has been excellent. In the spring term an outbreak of mumps occurred, but thorough cleaning and disinfection during the summer vacation, under the matron's direction, has been effectual in preventing a recurrence. There has been no case of infectious disease contracted at the college this fall term.

The Volunteer Fire Brigade, composed of resident students, has been organized for another year, and its efficiency has been tested by false alarms and emergency calls. Great credit is due to the students who compose the brigade for the readiness for duty and efficiency displayed.

My work in English is confined to First Year Composition. I endeavour to teach the general principles of rhetoric, and the broader technique of the essay. With a class of 150 students of various degrees of proficiency, a detailed course of grammar is impossible. Subjects are assigned for composition, and the essays are corrected, noted, marked and returned to the student.

In conclusion, I wish to express my appreciation of the able support given me by Mr. A. W. Baker, who, in addition to his other work, has assisted me in the residence.

I am, Sir, yours respectfully,

S. H. HOPKINS.

PART XXI.

THE LIBRARIAN.

To the President of the Ontario Agricultural College:

SIR,—I have the honour to submit to you the report of the Library for the year 1911.

During the year, 1,043 volumes have been added to the Library. These are classified as follows:

Agricultural Reports	94	Fine Arts	22
Agriculture	57	Forestry	9
Bacteriology	28	Geology	11
Bees	15	History	34
Biography	18	Horticultural Reports	5
Botany	26	Horticulture	14
Chemistry	63	Hygiene	25
Dairy	27	Literature	93
Description and Travel	30	Manual Training	12
Domestic Animals	86	Meteorology	10
Domestic Science	16	Physics	5
Drawing and Decoration	12	Poultry	5
Economics	55	Psychology	2
Education	30	Reference Books and general Magazines	33
Engineering	29	Science	29
Entomology	10	Science Reports	6
Ethics and Religion	70	Useful Arts	16
Fiction	41	Zoology	7

The following books have been added to the Reference Department:

Allibone. Critical dictionary of English literature. 5 vols.
Cambridge Bible for Schools and Colleges. 48 vols.
Traill, H. D. Social England. 12 vols.
Larned. History for Ready Reference. Vol. VII.
International Library of Technology. 19 vols.
Readers' Guide. 1904–1909.
Statesman's Yearbook.
Canadian Who's Who.
Harper's Classical Dictionary.
Reports of the Society for the Promotion of Agricultural Science.

Volumes of periodicals and bulletins to the number of 191 have been bound, and 22 books needed rebinding. Several volumes of Gleanings in Bee Culture, of "The Canadian Bee Journal," and of the Keramic Studio have been bound.

But four books have been lost during the year; three of these were lost while in circulation. This is the smallest number in some years.

The circulation from September 1st, 1910 to August 31st, 1911, was 5,892, while that for the year preceding was but 4,883.

General Periodicals	536	Agriculture	1,472
Philosophy	40	Fine Arts	54
Religion	26	Literature	623
Sociology	589	Fiction	815
Science	1,148	History	194
Useful Arts	301	Biography	94

We wish to take this opportunity of expressing our appreciation of all our Exchanges, especially of those of the U. S. Department of Agriculture, and of the Experiment Stations of America, Australia, Cape Colony, England, Europe, India, Japan and South America. We are very grateful to the various U. S. Experiment Stations for helping us to complete our files of their reports, many of which we have now from the beginning.

The assistant librarian, Miss Margaret Frew resigned during the summer, and has been succeeded by Miss A. J. Gardiner, who comes to us from the Sarnia Public Library.

Respectfully submitted,

EDITH C. DWIGHT.

PART XXII.

THE PHYSICIAN.

To the President of the Ontario Agricultural College:

SIR,—As recently requested by you I herein present my report for the year now closing.

You will remember only too well the experiences of last winter and the loss of time to our students from sickness due to invasion by measles and mumps in addition to the illnesses and accidents ordinarily occurring in the College and Hall. For a period of six weeks or more we were obliged to have the services of a nurse in caring for the large number of sick students. Last winter's experience demonstrated again the need of suitable accommodation for the isolation and care of infectious diseases occurring in the College, especially measles and mumps, for which the city hospitals at present are unprepared.

Thus far this term we have enjoyed freedom from grave illness in the College and Hall. About the usual number of minor ailments and accidents came under my care, and two students required operation for the relief of surgical conditions from which they suffered. Both experienced satisfactory results.

As in former years, I was obliged to vaccinate a number of students at the opening of the term, and I desire again to state that the rule requiring vaccination before admission should be rigidly enforced.

Respectfully submitted,

W. O. STEWART.

Dec. 30th, 1911.

PART XXIII.

THE PROFESSOR OF NATURE STUDY.

To the President of the Ontario Agricultural College:

SIR,—I have the honour to present herewith a brief report of the Nature Study Department for the year 1911, this being the eighth annual report of the department, and the seventh which I have made.

As the work of the Department has been fully set forth in Circular 13, issued by the Department of Education, it will not be necessary to report at length here. It was thought advisable to issue it as a teachers' circular, as the report is concerned largely with the teaching of agriculture in the schools. It has been sent to every school in Ontario and is available as a free Government publication for anyone desiring it.

The work undertaken and carried out during the year repeats in a large measure the work of the previous two years in teacher-training, nature study correspondence with teachers and pupils, and extension work in school gardening.

By my appointment last summer as Director of Elementary Agricultural Education under the Department of Education, the work of this Nature Study Department becomes an integral and fixed part of the school system of Ontario, operating particularly in connection with the rural schools. With the official support of the Department of Education, which this new connection brings, it may naturally be expected that the service for which the Nature Study Department was established in 1903, will become more and more acceptable, and that before many years our rural schools will be, with few exceptions, furnishing their *clientele* with a fair measure of practical and sound instruction in the elements of agriculture. I trust that satisfactory arrangements may be made for keeping the Nature Study Department a "go-between" between the two Departments of Education and Agriculture. In my office as Director of Elementary Agricultural Education, I feel that I must remain closely connected with the Ontario Agricultural College: indeed my chief work will be to interpret the teachings of the College and the findings of the Experimental Farm to the schools throughout the country.

Respectfully submitted,

S. B. McCREADY.

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REPORT

OF THE

Ontario Veterinary College

1911

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty
1912.

Printed by
WILLIAM BRIGGS,
29-37 Richmond Street West,
TORONTO

To His Honour Col. Sir John Morison Gibson, Knight Commander of the Most Distinguished Order of St. Michael and St. George, a Colonel in the Militia of Canada, etc., etc., etc.,

Lieutenant-Governor of the Province of Ontario

May it Please Your Honour:

I have the pleasure to present herewith for the consideration of Your Honour the Report of the Ontario Veterinary College, for the year 1911.

Respectfully submitted,

JAMES S. DUFF,

Minister of Agriculture.

Toronto, 1912.

COLLEGE STAFF AND SUBJECTS TAUGHT.

E. A. A. Grange, V.S., M.S., Principal,
Contagious Diseases of Animals and Veterinary Hygiene.

T. G. Brodie, M.D., F.R.S.,
Physiology.

C. Heath Sweetapple, V.S.,
Librarian and Curator of the Museum.

W. J. R. Fowler, V.S., B.V.Sc.,
Anatomy, Obstetrics, Sporadic Diseases of Cattle, and Surgery.

J. A. Amyot, M.B.,
Bacteriology.

J. N. Pringle, M.R.C.V.S.,
Sporadic Diseases of the Horse, Dentistry, and Principles of Horse-shoeing.

D. King Smith, M.B., V.S.,
Pathology and Parasitology.

M. D. McKichan, B.A., M.D.,
Histology, Zoology and Demonstrator.

Paul L. Scott, M.B.,
Pharmacy.

C. G. Saunders, V.S., B.V.Sc.,
Canine and Feline Diseases.

H. E. Hurd, V.S.,
Dairy Inspection.

Dyce W. Saunders, K.C.,
Veterinary Jurisprudence.

F. B. Kenrick, B.A., Ph.D.,
Chemistry.

C. A. Temple, M.D., C.M.,
Materia Medica.

J. Horace Faull, B.A., Ph.D.,
Botany.

A. C. Walker, V.S.,
Meat Inspection.

C. F. Bailey, B.S.A.,
Breeds and Breeding, Foods and Feeding, Judging Animals.

G. B. Cash, V.S., B.V.Sc.,
Demonstrator.

H. G. Wilson, B.A., M.B.,
Demonstrator.

L. T. Addison, B.A. M.D.,
Demonstrator.

S. A. Cudmore, B.A. (Oxon.),
Tutorial Instructor.

Jas. E. Anderson,
Executive Clerk.

Report

OF THE

Ontario Veterinary College

1911

To the Honourable JAMES S. DUFF, *Minister of Agriculture, Toronto.*

SIR,—I have the honour to submit the following report of the Ontario Veterinary College for the year 1911. The progress of the College has been steady, and some important branches of the course have been amplified so as to make the instruction given in them more thorough, and consequently more valuable to students. In an effort to keep abreast with the times the laboratory method of teaching has been extended from year to year, and since my last report a course in laboratory pharmacy has been given, and the courses in histology and pathology have been largely extended. The equipment for teaching the foregoing branches has been added to in proportion with the growth of the subject, and modern improvements have been recognized in the purchase of new material. Arrangements have also been made whereby a laboratory course in physiology will be given next term.

A great advantage in the laboratory method of teaching is that the student can make his own investigations, and follow up problems with the aid of a microscope or other equipment used in the work of this kind, and thus obtain a practical knowledge of each subject which would otherwise be largely theoretical.

The total number of students in attendance during the year was 377.

The College employs 21 teachers on its staff at the present time.

The written examinations held previous to the closing of the spring term in April numbered 33, which were arranged according to the subjects taught, so that each and every group of students in the three different years of the college course received a full set of examinations.

During the month of March, 1911, the Veterinary College had the pleasure of a visit from Professor V. A. Moore, of Cornell University, at which time he delivered a most instructive lecture in our main class-room, entitled, "The Relation of Microscopic Organisms to the Cause of Disease." The subject was so handled that rounds of applause and hearty congratulations came from those who were fortunate in being present.

In order that the best results might be obtained from the lecture, arrangements were made whereby minute structures and microscopic organisms were projected from a stereopticon and enlarged upon a suitable sheet, thus making various features of the discourse the more impressive and easy to comprehend.

The stereopticon method of teaching certain subjects in the college course has proven of such value to our students that equipment for the purpose has been permanently installed in our class-rooms.

On the 25th of April the closing exercises of the college were held in the Convocation Hall of the University of Toronto, at which time 101 graduates were awarded the diploma of the College entitling them to the degree of Veterinary Surgeon (V.S.). After the presentation of the diplomas the following address was delivered to the students, and others who were present:

ADDRESS.

PROFESSOR W. HORACE HOSKINS, OF THE UNIVERSITY OF PENNSYLVANIA.

I deem it a great privilege on this occasion to have been called from the States to speak to this body representative of the interest that Canada has shown in the field of veterinary medicine. I come not as a stranger to your country, but one familiar with the history of your veterinary institutions for the past fifty years, and I am somewhat intimately acquainted with those who have directed the institution for the past thirty years. I would be indeed forgetful if I failed to acknowledge here the great services rendered by the late principal of this institution, Professor Andrew Smith, a pioneer in veterinary education and the practice of veterinary medicine and surgery in your own country, with whom his life work was indissolubly bound and with the development of your country in the broad field of agriculture and the domain of animal industry. He was a loyal man to his country; a devoted teacher and instructor, deeply interested in his student body, ever rendering to them the highest scope of instruction within his power. Filled with true civic pride and deeply interested in the welfare of the people of his country, he rendered great services indeed in helping to solve many of the economic problems of his land, and contributed in many ways to the development and prosperity of the people.

In the choice of Prof. E. A. A. Grange as Principal, I equally rejoice with you, as the successor of Prof. Smith, so distinguished an alumnus of the school and so worthy a member of the profession, imbued as he is with the highest ideals and purposes for our calling, assures the maintenance of the highest standard of education and the deepest and broadest interest for the protection of the live stock interests of all the Canadas.

I rejoice that I come at this time, the most auspicious within the history of veterinary education in Canada. It has long been recognized by those deeply concerned in veterinary education that it could not reach its full development unless supported by State or the national Government.

The scope of veterinary medicine is so far-reaching and important from an economical point of view, that unless supported by national or State Government it must ever remain limited in its sphere of progress and true development. I congratulate the Province of Ontario and the other loyal Provinces of Canada in granting to this institution Government support that its long history of work well done justly entitles them to. The rich return it has given in the past to the people of your country makes it indeed justly merited. No field of learning has contributed so much to the wiping out of the imaginary or other boundary lines, whether they be of the narrow space determined by latitude and longitude, or the vast waters of the oceans and seas, than the field of comparative medicine as one

of the sciences. The freest exchange between all nations of the earth has ever existed in the development of scientific medicine, and no nation has withheld from sister nations her discoveries, advancement or progress in the relief of suffering or in the saving of nations from great economic losses by the ravages of contagious or infectious diseases. Quick to respond, eager to extend, ever desirous to be helpful, comparative medicine has made the whole world akin, and in this way has contributed indeed untold aid and helpfulness in the preservation of peace and good will throughout the earth. I am not unmindful, and take the opportunity with the keenest personal pleasure, to pay tribute to the splendid work done under the Government of Canada in solving for her people, as well as the people of the earth, many of the obscure problems that sometimes cause pecuniary losses to your people as well as being destructive to the happiness and comfort of those engaged in the field of animal industry, the result of years of labour, sacrifices and self-denial. The generous support given by your Government to the system inaugurated by your chief veterinary director-general, Dr. J. G. Rutherford, a distinguished graduate of this school and a worthy public servant, has been the means of opening up thousands of acres of your untilled land and furnishing to a vast number of your own people and many of my own country, a field of employment and industry that has added millions to the wealth of your great country and aided the proper development of your nation. More far-reaching, indeed, than one can conjecture is the added strength and power of your people in solving for the older nations and for nations yet to come the problem of wise and just government that equal rights to all men and special privileges to none shall make for the well being, happiness and comfort of the people of every nation and clime.

No field of industry of all scientific research has been a greater factor in contributing to the betterment of the world and the common brotherhood of man than the free exchange of knowledge and the progress of solving these great problems, as well as those that conserve the strength and health of all the people of the earth. And I rejoice that I am privileged to come at this time in this history of our sister countries, when a feeling pervades the great majority of the people of your country and my own that no false boundary lines should separate us in the common enjoyment of all things that would contribute to our comfort, our health and to our common commercial prosperity.

The field of comparative medical science is, perhaps, the broadest field that young men may enter, and with a deep sense of appreciation I speak of my distinguished late fellow-member Leonard Pearson, of Pennsylvania, who coined the name "Animal Engineer," and for the field of comparative medical science that of animal engineering.

The field of veterinary science is no longer a limited one of mending the broken parts of the animals that come within our domain, but the richer, broader work of controlling animal diseases throughout the earth: the saving of nations from the great economic losses by animal plagues, the records of which precede the story of the earth as told by the Bible: the field of animal food inspection that must determine the physical strength: the freedom from diseases: the happiness and prosperity in a great meaure of the people of every land on the face of the globe. The study of animal food problems and their best methods of uses, means: indeed, the determination of commercial wealth and prosperity of those engaged in agriculture and animal industry.

To you, members of the graduating class, I congratulate you on your entrance

Ontario Veterinary College students study best types of animals on nearby farms.

to the veterinary profession at this, the initial period of its true growth and development. I congratulate you for the spirit of unselfishness that has controlled your minds in selecting this field of service for your life work. The field of veterinary medicine is not an avenue to great wealth. It does not even assure a competence in old age or in the evening of your lives. It does afford, beyond all, an opportunity to contribute to the well being of your fellow man and an ever changing field of scientific advancement that will afford an outlet to all your energy, all your desires of investigation, and bring to you the rich reward and realization that you have added something for the betterment of mankind and much to the true growth of commercial prosperity of the people among whom you will spend your future lives. While trying at times, and severely taxing to your vital powers, there will come a rich return in the feeling that your work has been much beyond its pecuniary value to the well being of your fellow-men. In the swift changes of the commerce of the earth and the restrictions along many lines for employment of one's education, there must be training and ability that will afford an outlet for the same without subordinating oneself entirely to the control of others. The field of your work will at all times enable you to be a good citizen and devoted worker in determining all the great and complex problems that confront the true solution of national, state, and municipal government, and make you a factor in the world's progress along these lines as you may elect to be. Your own country, as well as mine, never in their history needed stronger men than they do at this hour, and the independence afforded you by your adopted profession should make you greater and greater factors in the true development of our sister nations.

Your school, under the fostering care and support of your Provincial Government, has better equipped you than any of your predecessors, and has equally laid upon your shoulders greater responsibilities than upon those who have preceded you. The world is a justly exacting world, and, when you have finished your work, it will not be measured merely by the standard that you have attained, but whether you have rendered in return all that was within the scope of your ability. You owe them the deepest interest in everything that tends to the advancement of your own calling, all that will contribute to its greatest worth to the individual, the community, state or nation, and with the rich endowment which has been your good fortune to receive. I have no doubt that you will render a just and adequate return.

For the second time in the history of the American Veterinary Association, now almost at the end of fifty years of continuous service, it will, in August next, makes its second bow within the domains of your provinces. It comes in its greatest strength and power, and at a time when its support, usefulness and worth has made itself felt as a strong power for great good to all the people within the boundaries of America. It comes to this city with a membership of more than a thousand interested and devoted men, and I am sure that if one part of the great good achieved by its first meeting at Ottawa is attained at this convention, it will more than repay every devoted attendant at the meeting, whether he comes from the shores of California or the Gulf of Mexico or the Atlantic slope. The rich result attained by our first meeting within your territory added a strength to our organization that has brought the richest return. I may but refer to one achievement — the report of the International Committee on Animal Tuberculosis — rendered at San Francisco in September, 1910, whose work was a product of the

directing power of your distinguished Veterinary Director-General, J. G. Rutherford. The Association by this one attainment warranted all its previous years of effort and service to the profession and our common country.

This Association as well as kindred organizations should at once attract you and win your support and interest. They are the channels through which our most effective influences may be exerted. They represent the altar upon which our contributions may be placed and from whence their benign influences may be spread throughout the veterinary world. It is the place and forum where every advancement and achievement may be thoughtfully weighed and considered, and where the richest and most perishable monuments may be reared to mark the worth and value to the profession and among the progressive people of the earth. Among its records may be written every triumph of your skill and services, that make the priceless history of the progress of every occupation and field of labor of man. The names of Michener, Liautard, Law, Huidekoper, Smith, McEachran, Pearson, Salmon, Rutherford, Harger, Dalrymple, Dinwiddie and many others are ineffaceably written upon the progress of veterinary medicine in America, and make up an important part of the record of our veterinary associations.

In your own country the Veterinary Association of Manitoba has been foremost in the best work done for united action of the profession. In that province the best laws for her people have been enacted. No province in your own country and no state in mine has done more to encourage the best growth of the profession and given greater security and protection to the people and the live stock interests.

In conclusion, permit me to say that I know of no keener pleasure or delight, than to say to your institution and to your Government that we in the United States owe, indeed, a great debt for the many young men educated under your fostering care. My native state of Pennsylvania, the keystone of the arch, has received more than 150 of your graduates.

Our country as a whole has welcomed to its forty-seven states more than 1,700 men educated from the institution from which you are about to emerge. Many of this number have rendered distinguished services in every aspect of our work, and the broader field for your employment welcomes you equally to as distinguished services and assures all of you a just and generous recognition for every help and aid you may give to the progress of the world's work. I therefore, bid you a hearty welcome to the ranks of the profession whose work I have personally enjoyed for more than thirty years. I thank most cordially your Principal, instructor and teachers for the equipment they have guaranteed to you, and to the nurturing care and deep interest which the provinces of Canada have ever shown in the development of veterinary medicine and the recognition of the members of the veterinary profession in places of honour and trust for which I am profoundly grateful, and bid your country on to greater service and achievements.

DEGREES GRANTED.

In the month of June two of the graduates of 1910 were awarded the degree of Doctor of Veterinary Science (D.V.Sc.) at the convocation of the University of Toronto, and at the same time and place, 51 of the graduates of this college received the degree of Bachelor of Veterinary Science (B.V.Sc.) also from the University of Toronto.

INTERNATIONAL CONVENTION.

During the month of August both the Veterinary College and the Veterinary profession in general received material benefit from a meeting in this city of the largest and most influential gathering of Veterinarians on this Continent, if not the entire world. The Society which called them together is an international one, and known as the American Veterinary Medical Association. It is composed of some 1,200 members who are more or less scattered over North America, there were about 700 of the more enthusiastic members at this meeting, besides a large number of visitors, and burning questions of the day relating to veterinary education, the eradication of contagious diseases, and other important questions of a sanitary nature were freely discussed by talented men.

The meeting extended over a period of four days, and the President of the Association in writing of it to a scientific journal says: "I presume that this was the largest, most enjoyable, and successful meeting in our history." (The Society is forty-eight years old.)

In order that the importance of this organization may be better understood, I am taking the liberty of embodying in this report the address of welcome to the Province of Ontario by yourself, as Minister of Agriculture, as well as the address of welcome by His Worship the Mayor, George R. Geary, to the City of Toronto, and also the response to these addresses by Doctor V. A. Moore, a prominent member of the Association.

ADDRESS OF WELCOME TO THE PROVINCE OF ONTARIO

Hon. James S. Duff, Minister of Agriculture, Toronto.

I am glad indeed to appear this morning on behalf of the Government of our Province, and to extend to you a very hearty welcome to this beautiful city of Toronto, the capital of the Province in which you are now holding your annual convention. I am very sorry that, owing to circumstances over which the Prime Minister of the Province had no control, he was unable to be here in person and extend to you a proper welcome to Ontario, but in his absence I am here to perform that duty. I can assure you, sirs, that the people of this Province, from one end to the other, and I think I may go further and say that the people of the country as a whole are looking with a great deal of interest upon the work that is being performed to-day by the various veterinary associations and colleges, not only on this continent but elsewhere. I am very glad to hear that it was the speech of the Principal of our college here in Toronto, Dr. Grange, that was the means of your deciding a year ago to hold this annual convention in Toronto. I shall not be quite satisfied unless, when you have put in your days in session here and finished your business, you again put in several days in seeing this beautiful city, and possibly some of the territory bordering upon it. If you do, I think that you will feel that your trip to Toronto has been well worth while, and that Dr. Grange did not say too much for his province while pleading with you to make it your meeting place for this year.

Veterinary science in our own province has been making splendid strides. The Veterinary College is now fully affiliated with Toronto University, and stands

Students of the first year class assembled for work in the Chemical laboratory.

in the same relation to it as to the Agricultural College at Guelph, and the various other colleges of which you will see evidences if you walk through this splendid aggregation of buildings in the park which surrounds this great university of this province.

Since assuming direction of the veterinary college of this province we have, under Dr. Grange's superintendency and influence, gone on until we are fast outgrowing the buildings down on Temperance Street. Arrangements have been made, and we hope before another year that a beautiful new college building will be erected in University Avenue, which will be not only a credit to the City of Toronto but to all those who have taken an interest in veterinary science in the Province of Ontario during the last forty or fifty years. Speaking for the Province, I may say that anything that we can do in the direction of aiding and helping on the development of veterinary science in connection with the work as it is taught to-day in the College, either in the old college or as it will be in the new college, will be gladly extended. It is not a matter for the City of Toronto alone, or for the people of Toronto, but it is altogether a matter of provincial concern and the people in northern Ontario are equally interested with those in this portion of the Province to do everything within reason for the development and upbuilding of the school in Toronto, and for the further development of this great science, as it has now come to be, of veterinary work. The eastern provinces of Canada, and the people located in those provinces, are equally interested in the work which is being carried on in this college.

Our entire people now realize the importance of the development of veterinary science, because as time goes on the people find that it is very much to their advantage, particularly the people of the profession or occupation to which I have the honour to belong, the agricultural, that the men who get out into the different portions of the Provinces, and into our cities, towns, and villages, and hang out their shingles (to use a common phrase), shall be fully fledged and well equipped veterinarians: that those men shall be equipped in the fullest manner in order to do justice to the people, and take proper care of their live stock interests, in order that they may render the best service in a professional way to the people of the locality to which they go. I think I am safe in saying that this is becoming more and more apparent. In fact, it has been amply proven, and when we look over what has taken place in the Veterinary College here in Toronto during the last five or six years it is not necessary to look for any further proof.

I wish again on behalf of this great Province to extend to you a hearty welcome. The Province of Ontario is, in many respects, the greatest of this great confederation of which we are proud, and we beg to extend to you a royal Canadian welcome, and we sincerely trust that your visit to the city will be of such a character that, whether you live in the great republic to the south of the international line, or whether you live in some other province or part of the Dominion of Canada, or whether you have come here from some other part of the world, you will go away from this international convention with splendid recollections and fond memories of your visit to this beautiful city of Toronto. I again assure you that all over the Province the people will take a great deal of interest in your daily deliberations, and we sincerely hope that these deliberations will not only be of benefit to our great organization over which you preside, sir, but will perhaps be of some particular benefit to the Veterinary College of this Province, under whose auspices you are convened at the present time, and whose guests you will be for the days of your stay in this beautiful city.

ADDRESS OF WELCOME TO THE CITY OF TORONTO.

MAYOR GEORGE R. GEARY, TORONTO.

It was my good fortune this morning to have the opportunity to talk to your President, thus giving me some idea of the basis of this organization, and of the spirit in which the organization desires to progress and to make of itself something better even than it is at the present time; or as it was, I imagine, in its original state.

In Toronto we have been particularly attracted to this profession of yours for a great many years. I think our local college is one of the oldest of all the veterinary colleges; perhaps the oldest, and I do know that we could always depend upon our university for turning out good men, well trained men in the veterinary profession. The veterinary department is now one of the well qualified departments of our university activity, and it has attracted to its courses some pretty sturdy fellows, for the backbone of the football team has usually come from the Veterinary College. Dr. Andrew Smith, who was actively connected with the college until within the last three or four years, was probably the most respected citizen of Toronto, and was one of the very finest men that we have ever had in this city. He commanded both respect and admiration, and under his care and management the Veterinary College attained a very high standard, which it maintained through many years.

Mr. Duff, the Minister of Agriculture, has given you a welcome to the Province of Ontario, and has told you something of the connection of the veterinary school with the university. The school of veterinary science, as I understand it, is now a part of the university, which is a State institution, and I think that all visitors to this convention will feel that their professional interests are being taken good care of, inasmuch as the school in which you are more particularly interested is affiliated with the University of Toronto, thus commanding the attention and assistance of the Canadian Government and the active support of the Province of Ontario.

Some months ago Dr. Grange of this city, who has been very active in your behalf, intimated that possibly we could get this great convention to come to visit us. He went to San Francisco and was armed with our invitation and our authority to say to you all that he might wish to say to you in order to induce you to come. We were, indeed, very much pleased, and, in fact, more than pleased, when he reported that he was able to say that you had decided to do us the honor of holding your next annual convention in this city. I assure you that we were delighted to receive that information, and are glad indeed that you are with us.

The city of Toronto gets its name from being the meeting place of the tribes of Indians who formerly inhabited this portion of the country. I understand that in the days before there was very much business done here that there were conventions of gentlemen decorated in all of the insignia of war that their limited knowledge enabled them to put upon themselves, and that they came here not only for purposes of that kind, but on other occasions that they came here for peaceful purposes and for social enjoyment. That good old custom has been continued, and to-day Toronto is the scene of many conventions of different societies. We are always glad to see them, and just as often as they go we wish that they may soon come back. We look forward with anticipation and pleasure to having

you come back, and we shall look back to your visit and regret that you have not been able to come before, and shall look forward with anticipation and with the hope that at some future time you may again do us the honour of making Toronto the place of holding your annual meeting. I hope the ladies and gentlemen who are here will have a very pleasant time in the city, and that good results will come from your deliberation in the interests of your profession. This Association will do a great deal, I am quite sure, to place the profession of veterinary medicine in the position to which it is entitled, and which I think it has, in a great many directions, already attained in a very marked form. Some our very best citizens are in your ranks, of whom we are very proud, and I am sure that this very representative gathering is entitled to our respect, as it surely is to our warmest welcome to Ontario and Canada.

RESPONSE TO ADDRESSES OF WELCOME.

Dr. V. A. Moore, Ithaca, N.Y.

On behalf of the members of the American Veterinary Medical Association I have the privilege and the honour of extending to you, to your Government and to the citizens of Toronto our sincere thanks for your most cordial and gracious welcome. In reply to your timely words of appreciation of the veterinary profession, I wish to say that its members here are exceedingly grateful. This is the youngest in America of the so-called learned professions. Because of this it has been and still is confronted by many perplexing problems, in carving its place of highest usefulness in these great countries. It has grown from the few men who gathered around John Busteed and Alexander Liautard in New York, and a half-dozen men who surrounded Andrew Smith in Toronto more than half a century ago, to a profession numbering many thousands. In the beginning it dealt simply in treating the sick and the injured. To-day in addition to its earlier duties, it looks after the many and complicated tasks of preventing epizootics and safeguarding the human family from the plagues that come to it through dumb creation.

We are gathered here in the spirit of true reciprocity. We have come from nearly every, if not every state in the Union, from across the seas and from nearly if not every province in this great country of yours. We have come with treasures consisting of tried and carefully correlated experience in the humane effort to relieve suffering and to control epizootics and other diseases. In the marts of commerce such treasures would bring the highest price, but these men have come, some great distances, each to give to others that which he can assimilate and apply. Where among statesmen, philosophers, or in the realm of commerce can be found a better example of genuine reciprocity?

It is very fitting that this Association should meet from time to time in your city. Up to 1905 more than half of the veterinarians in the United States and Canada received their professional training in Toronto at the school which is held in such high esteem by so many of the profession. Toronto, therefore, is the widest known centre for veterinary education in America. This Association brings its greetings and congratulations that the school established by private enterprise has become affiliated with a great university where it will receive that stimulus for better and more efficient work which comes only with the introduction of the true university spirit. In earlier times this was not thought to be necessary for

the veterinarian, but the hour has come when the mysteries of the laws of nature that have been revealed in the many causes of disease, the specific reaction of animal tissues to irritants, the intricate interlacing of susceptibility and immunity, together with the delicate balancing between normal and abnormal physiology, demand an extent of scientific training not excelled by any of the other professions. For this reason we rejoice in the plans for the future scientific development of our host, the time-honored Ontario Veterinary College. As the members of this Association gather from year to year there is a growing appreciation of the duties, responsibilities, and the obligations of the veterinarian as a professional man. Its members have grown out of petty jealousies and selfish interests and assemble at these great annual gatherings for the purpose not only of acquiring information by which to increase their efficiency as practitioners of medicine and surgery, but also to ascertain more clearly those things which they can do to enhance their value as loyal citizens in this great warfare against disease.

With these few brief statements as to the kind of men we are, and the purpose for which we are here, I wish to extend to you and to the citizens of Toronto interested in this work a most cordial invitation to attend our deliberations, and to assure yourself of the real spirit, the purpose and the genuineness of the modern veterinarian. I again assure you of our appreciation of your welcome and congratulate the Association on the privilege of meeting under such delightful auspices.

ONTARIO VETERINARY ASSOCIATION.

On the 23rd of August, 1911, a meeting of the Ontario Veterinary Association was held in the College.

The President (C. Brind, V.S.) opened the meeting at 2 o'clock p.m. In his short address, he explained that in consequence of the annual meeting of the American Veterinary Medical Association being held in Toronto this year, at the present time, it would be best to condense the business of the meeting as much as possible.

The more formal order of business being despatched, and the officers for the ensuing year elected, the meeting adjourned.

It may be said in connection with the Ontario Veterinary Association that it is the pioneer of its kind on this continent, and has done much to advance the interests of veterinary science in this province.

REGISTRATION FOR 1911.

The number of students who registered at the opening of the college in the autumn of 1911 was 258.

DOMINION CIVIL SERVICE VETERINARY EXAMINATION.

In the spring time of 1911 an examination was held in our College under the auspices of the Health of Animals Branch of the Dominion Department of Agriculture, at which 49 of our graduates were successful in passing the said examination and are thus eligible for employment in that branch of the Dominion Civil Service.

A ward in the Veterinary Infirmary of the College.

BRIEF SYNOPSIS OF METHODS ADOPTED IN TEACHING VARIOUS BRANCHES OF VETERINARY SCIENCE IN THIS COLLEGE.

Contagious Diseases of Animals.—Will be taught by lectures illustrated with diagrams, diseased tissues, and, when possible, with infected animals.

Veterinary Hygiene.—Taught by lectures illustrated with materials used in promoting health, and observations in the veterinary infirmary of the College.

Sporadic Diseases of Animals.—Embracing various diseases which are not regarded as contagious. Their causes, symptoms and treatment will be thoroughly described in lectures, illustrated with numerous specimens now in the Museum of the College, also with affected animals as they occur from time to time in the practice of the Infirmary.

Veterinary Anatomy.—Is taught by descriptive lectures in the class-room, and the applied science by a full course of dissection in the commodious dissecting-room near the main building of the College.

Veterinary Surgery.—Will be taught first in the class-room by illustrated lectures, and the applied science or practical work of the course will be freely demonstrated in an amphitheatre fitted up for the purpose.

Physiology.—Will include a course of about sixty lectures on the physiology of domestic animals, in which the following subjects will be discussed, viz.: The blood and phenomena of clotting, the circulatory mechanism of the heart and blood vessels, physiology of digestion and absorption of foods, chemical characters of different foods, digestive secretions, digestion in different parts of the alimentary tract, respiration and mechanism of the organs concerned, the physiology of ductless glands, neuro-muscular mechanism, the central nervous system, the production of heat in the body and the regulation of body temperature, the central nervous system and functions of the chief parts of the brain, the physiology of the special senses; the physiology of the kidneys and other excretory organs.

Veterinary Materia Medica.—Will embrace a description of the most important drugs and agents used in the cure of disease and the alleviation of pain, including their actions, uses and doses for the various domestic animals. The practical teaching of this branch of the course will be conducted in a suitable pharmacy, as well as in the stalls of the infirmary.

Veterinary Pathology.—The course in this subject will extend over two years and will include a series of lectures and laboratory demonstrations, macroscopic and microscopic. The lectures are divided so that general pathology is taken up the first year, and the following year is devoted to special pathology. Gangrene, degeneration, infiltrations, inflamation, tumors, cysts, hypertrophy, atrophy and bone disease are some of the subjects which will be discussed.

Veterinary Histology.—Will be taught by illustrated class-room lectures, all of which will be demonstrated in a spacious room for this purpose, and the student will be required to prepare, mount, stain and examine with the aid of a microscope various tissues in health and disease in the laboratory.

Veterinary Obstetrics.—Will be taught by a full course of lectures, illustrated with large diagrams and numerous instruments used in the practice of this most important art.

Post Mortem Demonstrations.—Will be conducted by descriptive lectures and autopsies, on subjects procured for the purpose, in the amphitheatre of the College.

Bacteriology.—This branch of the College course will receive full consideration through numerous lectures in which special attention will be given to technique in preparing and studying certain micro-organisms or germs, especially those which are believed to cause disease. The study of toxins and the preparation of anti-toxins, vaccines, and other biological products will be extensively discussed and demonstrated. An extended laboratory course is given in this subject.

Chemistry.—Will be taught by lectures and a course of laboratory instruction.

Zoology.—Will be taught by illustrated class-room lectures, and by laboratory methods.

Botany.—Will be taught by lectures in the class-room. The applied science will be taught by laboratory methods and from specimens procured in the field.

Entozoa and Ectozoa.—Will be taught in the class-room, and the practical feature of the subject will be illustrated by specimens and microscopic preparations and drawings.

Veterinary Dentistry.—This branch of our course will be fully discussed in illustrated lectures in the class-room, and the practical education of the student in the art will be fully demonstrated in the amphitheatre.

Breeds and Breeding of Domestic Animals.—Will be taught by lectures illustrated by diagrams in the class-room, and living animals at famous stock farms in the vicinity of Toronto.

Meat Inspection.—Will be fully taught both in the class-room of the College and at Abattoirs, in a manner which will be in accord with the laws and regulations of Veterinary Sanitary Science throughout the Dominion.

Horse Shoeing.—Will be fully discussed in the class-room, and practical illustrations of the art will be conducted in the amphitheatre of the College.

Veterinary Jurisprudence.—Will consist of a course of lectures, including a number of subjects which are important to the veterinary surgeon, such as contracts relating to the purchase and sale of live stock, unsoundness and vice in horses or other animals, the straying and impounding of animals, laws relating to transportation of live stock, laws relating to the spread of malignant diseases, laws relating to diseased meats, laws of the road, the law of warranty and kindred subjects.

Dairy Inspection.—Will include lectures in the construction of the dairy barn and milk house, the care of utensils, the handling of milk from the time it is drawn from the cow until it is placed upon the market for sale. Dairy cattle in health and disease, especially those which are communicable to the human family, through milk, and various other matters relating to dairy inspection.

FINANCIAL STATEMENT.

The following is the financial statement for the year ending October, 1911:—

RECEIPTS.		EXPENDITURE.	
Fees	$19,342 76	Salaries	$19,006 36
Miscellaneous	421 59	Rent	5,600 00
		Fuel, Light, etc.	1,493 93
		Contingencies	6,341 76
Total	$19,764 35	Total	$32,442 05

The Calendar of the College contains a full statement of the courses provided, copies of the examination papers, and class lists.

The gradual expansion of education in preparing young men for the practice of their chosen profession has rendered the present building inadequate for conducting the work of the many branches which are indelibly linked with Veterinary Science, and further, as the time is approaching when the present lease will expire another location for new buildings has been procured, and plans for the erection of more commodious class-rooms and laboratories, etc., have been carefully considered.

I have the honour to be, sir,

Your obedient servant,

E. A. A. GRANGE, V.S., M.Sc.
Principal.

Temperance St., Toronto,
31st October, 1911.

Students of the First Year Class, 1911-1912 and Members of Faculty.

AN ACT RESPECTING THE ONTARIO VETERINARY COLLEGE.

HIS MAJESTY, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:

Short title.

1. This Act may be cited as "The Veterinary College Act."

Ontario Veterinary College, continued.

2. The Ontario Veterinary College heretofore established in the City of Toronto, and conducted by the Ontario Veterinary College, Limited, under Letters Patent issued under the Joint Stock Companies Act, and to which certain powers were given by the former Agriculture and Arts Association, is hereby continued as The Ontario Veterinary College, under the direction of the Minister of Agriculture.

Appliances and equipment of College.

3. The said College shall be furnished with all such appliances and equipment as may be necessary for theoretical and practical training in the science and art of veterinary medicine, and in such other branches of education as may be requisite for the intelligent and successful performance of the business of a veterinary surgeon.

Principal and officers.

4. The Lieutenant-Governor in Council may appoint a Principal and such professors, lecturers and instructors as may be deemed necessary for giving instruction in the College and the promotion of its usefulness, and may pass by-laws regulating and prescribing their respective duties.

Substitution of courses in Agricultural College, etc.

5. The Lieutenant-Governor in Council may authorize the making of arrangements whereby instruction in any of the subjects prescribed to be taught in the College may be provided by the University of Toronto or by the Ontario Agricultural College, or by any other College affiliated with the University of Toronto.

Government and control of College.

6. The government of the College shall be under and according to such rules and regulations as the Lieutenant-Governor in Council may from time to time prescribe, and such rules and regulations shall contain provisions for the standard and mode of admission; the course of study; the fees to be charged; the sessions, terms and vacations; and such provisions as may be deemed expedient touching the conduct of students.

Rights and standing of graduates.

7. Every student upon the successful completion of the course of study, upon passing the prescribed examinations, and upon satisfactory compliance with the rules and regulations of the College, shall be admitted to the standing of a Veterinary Surgeon and shall have all the privileges and rights accorded by statute to a Veterinary Surgeon, and there shall be issued to every such student a diploma granting him the title, degree and standing of Veterinary Surgeon, such diploma to be attested by the signature of the Principal of the College and the Minister of Agriculture.

Issue of duplicate diploma in certain cases.

8. The Lieutenant-Governor in Council may by order make provisions whereby in case of the loss or destruction of any diploma issued by the former Agriculture and Arts Association, the former Ontario Veterinary College, Limited, or by the Minister of Agriculture, a duplicate diploma may be issued to the person entitled to the same.

9. It shall be lawful for the Lieutenant-Governor in Council in behalf of the Province to accept, hold and enjoy any gifts, bequests or devises of personal or real property or effects which any person or any government may think fit to make for the purpose of the said College. Accepting gifts, etc., on behalf of College.

10. The Lieutenant-Governor in Council may, if deemed advisable, appoint an Advisory Board to advise and assist the Minister of Agriculture in the management of the College, and may by Order-in-Council prescribe its duties and powers and the amounts to be allowed for the services and expenses of the members of such Board. Advisory Board.

11. The affiliation of the College with the University of Toronto is hereby continued, such affiliation to be only to the extent of enabling the students of the said College to obtain at the examinations of the University such rewards, honors, standing, scholarships, diplomas and degrees in Veterinary Science as the University under its statutes and the Acts of the Legislature in that behalf may be allowed to confer. Affiliation with University of Toronto, continued.

12. The Principal of the College shall at the close of each year present to the Minister of Agriculture a report upon the work of the College in such form as the Minister may approve, setting forth the staff, the course of instruction, the students in attendance, the examination results, the income and expenditure, and such general information as shall show the work being done, and this report shall be laid before the Legislative Assembly within the first thirty days of the session next ensuing. Annual report of Principal.

13. The Lieutenant-Governor in Council may purchase or acquire or lease such buildings and premises as may from time to time be required for carrying on the work of the College. Power to purchase or lease lands, etc.

14 The lease of the buildings and premises used by the said College from one Andrew Smith to the Minister of Agriculture, as representing His Majesty the King, and bearing date the twenty-eighth day of July, one thousand nine hundred and eight, is hereby approved. Lease from Andrew Smith approved.

15. No person or persons, association, company or organization other than is authorized under this Act shall, by advertisement or otherwise, use the name of the Ontario Veterinary College, and no person or persons, association, company or organization shall, by advertisement or otherwise, use any name similar or analogous to that of the Ontario Veterinary College, without first receiving the consent of the Minister of Agriculture in writing.

(*a*) Any persons violating the provisions of this section shall, upon conviction thereof, be subject to a fine not exceeding $50 and in default of payment thereof be liable to imprisonment for not less than thirty days. Penalty.

16. Section 1 of *The Act respecting Veterinary Surgeons* is hereby repealed. Rev. Stat. c. 184

Thirty-Third Annual Report

OF THE

Ontario Agricultural and Experimental Union

1911

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty
1912.

Printed by
WILLIAM BRIGGS,
29-37 Richmond Street West,
TORONTO.

To His Honour SIR JOHN MORISON GIBSON, Knight Commander of the Most Distinguished Order of St. Michael and St. George, a Colonel in the Militia of Canada, etc., etc., etc.,

Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

I have the pleasure to present herewith for the consideration of your Honour the Report of the Agricultural and Experimental Union for 1911.

Respectfully submitted,

JAMES S. DUFF,

Minister of Agriculture.

Toronto, 1912.

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UNION MEMBERS FOR 1912.

The following list of members includes all of those who are, or have been, connected with the Agricultural College, and have paid the annual membership fee for the present year. It is quite distinct from the list of co-operative experimenters, of whom there are now about 6,500.

Name.	Address.
Allan, F. W.	Churchill.
Allan, J. N.	Canboro.
Alton, F. C.	Appleby.
Angle, P. E.	Simcoe.
Angle, W. B.	Fork's Rd.
Anglin, R. L.	Brewers' Mills.
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Aylsworth, H. S.	Norham.
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Buchanan, D.	Florence.
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Cooper, W. W.	Kippen.
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Creelman, J. M.	Guelph.
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Gibson, M.	Davisville.
Gifford, F. C.	Guelph.

Name.	Address.
Gilroy, W. E.	Hamilton.
Goble, F.	Woodstock.
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Goulding, N. S.	Guelph.
Graessar, F. A.	Guelph.
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Graham, R. R.	Guelph.
Graham, W. R.	Oak Leaf.
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Harcourt, R.	Guelph.
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Ross, J. G.	Montreal, Que.
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Salkeld, T. J.	Goderich.
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Schuyler, R.	Jarvis.
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Sirett, A. W.	Rosseau.
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Smith, R. M.	Oakville.
Smith, W. H.	Chatham.
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Thompson, W.	Westwood.
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Varey, J. M.	Rocklyn.
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Walker, F. T.	Haysville.
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Weir, E. A.	Randwick.
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Whale, S. C.	Goldstone.
Whaley, R. C.	Brownsville.
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Wills, H. A.	Winger.
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Wilson, E. E.	Caledon.
Wilson, G.	Oakville.
Wilson, Jno.	Ojibwa.
Wilson, S.	Rolling Dam, N.B.
Winslow, J. H.	Chelsea Green.
Zavitz, C. A.	Guelph.

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President ..... Fred. W. Goble, Woodstock, Ont.
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Assistant Secretary ..... W. J. Squirrell, Agricultural College, Guelph.
Treasurer ..... H. L. Hutt, Agricultural College, Guelph.
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Auditors ..... A. W. Mason and R. R. Graham.

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Fruit Growing ..... Prof. J. W. Crow (Director), Adam Harkness, and Geo. Robertson.
Vegetable Growing ..... A. H. McLennan (Director), T. Delworth, A. J. Logsdail, and N. Sanderson.
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Agricultural Chemistry ..... Prof. R. Harcourt (Director), J. W. Crow, and W. McCalla.
Schools ..... S. B. McCready (Chairman), H. L. Hutt (Secretary), C. A. Zavitz, E. J. Zavitz, and Eli Robinson.
Agricultural Botany ..... Prof. J. E. Howitt (Director), E. A. Howes, T. G. Raynor, and Herbert Groh.

Committee on the Prevention of the Importation and the Distribution of Noxious Weed Seeds in Screenings:

Profs. R. Harcourt, C. A. Zavitz, G. E. Day, J. E. Howitt, and Mr. G. H. Clark.

TREASURER'S REPORT, 1911.

Receipts.		Expenditures.	
Balance from last year	$1,250 44	Agricultural experiments	$1,533 98
Membership fees, 378 at 50c...	189 00	School garden extension work	918 82
Government grant	2,750 00	Fertilizer experiments	100 00
		Apicultural experiments	395 25
		Reporting annual meeting, 1911	40 00
		Advertising meeting for 1912.	140 50
		Meeting of executive	10 35
		Total	$3,048 90
		Balance on hand	1,140 54
	$4,189 44		$4,189 44

We, the undersigned auditors, declare that we have audited the Treasurer's accounts and found them correct.

Robt. R. Graham,
A. W. Mason,
Auditors.

January 8th, 1912.

Ontario Agricultural and Experimental Union.

ANNUAL MEETING.

The thirty-third annual meeting of the Ontario Agricultural and Experimental Union was held at the Ontario Agricultural College, Guelph, on Tuesday and Wednesday, January 9th and 10th, 1912. There were in all six sessions. Besides these, there was a reception given for the ex-students of the College on Monday evening, January 8th, at the home of Dr. and Mrs. Creelman, to which the College officers were invited. Owing to the unavoidable absence of the President, Mr. W. J. Lennox, of Newton Robinson, the Vice-President, Mr. Fred. W. Goble, of Woodstock, presided. Upon the election of officers taking place, Mr. Goble was made President for the ensuing year. The reports and addresses which were presented, and the most important discussions which took place during the various sessions of the Experimental Union meeting, are embodied in this report.

SECRETARY'S REPORT.

C. A. Zavitz, Professor of Field Husbandry, O.A.C., Guelph.

The Ontario Agricultural and Experimental Union was organized in 1879, just five years after the Ontario Agricultural College had started. The Experimental Union included as its membership the officers, ex-students, and students of the College who paid an annual fee of fifty cents. The following quotation is taken from the original constitution of the Association:

"The objects of the Association are to form a bond of union among the officers and students, past and present, of the Ontario Agricultural and Experimental Farm; to promote their intercourse with a view to mutual information; to discuss subjects bearing on the wide field of agriculture with its allied sciences and arts; to hear papers and addresses delivered by competent parties; and to meet at least once annually for these purposes."

Experimental work was suggested in the name of the Association, and as a special privilege to ex-students and ex-officers who paid their annual fee. It was not until 1886 that the co-operative experimental work was taken up in connection with the Union as it is at present. Even in that year only twelve experimenters throughout the Province took a part in the work. In the next year, however, there were 60, and in the following year 93 co-operative experimenters. From that time on, the number of experimenters has increased from year to year until many phases of agriculture are now covered, and about 5,000 farmers are enrolled on the list of active workers from an experimental standpoint. The Experimental Union, therefore, at the present time is carrying out all of the original objects, and in addition to those it has established and is conducting probably the most extensive system of co-operative experimental work along differ-

ent branches of agriculture which can be found in any country. As the co-operative work started in a small way and has developed gradually, it has been enabled to get a strong footing in Ontario, and to exert a marked influence on the agriculture of this Province. The co-operative system, as it is carried on in Ontario, has some most commendable features. As time advances, co-operative work amongst the farmers is almost sure to be developed more and more in different countries. It contains certain features which are of the greatest importance in developing a strong and progressive agriculture. Various other agencies are doing excellent work, but a system of co-operative experiments for the farmers themselves has certain advantages not incorporated in any of the other agencies. The agricultural experiment stations are doing an excellent work in experimenting and investigating in a way which the farmers cannot do themselves; the agricultural colleges are doing noble service in imparting information to the young men and in giving encouragement and enthusiasm to the farmers generally; the branch experiment stations and demonstration farms have important places to fill in giving an opportunity to conduct experiments on different kinds of soils and bringing the work closer to the homes of the farmers; the farmers' associations, institutes, and clubs have had a marked influence in bringing the farmers together to discuss problems of deep interest to them in connection with their farming operations; the short courses, demonstration trains, and orchard meetings have become popular in backing up public addresses by practical demonstrations and object lessons; agricultural classes in the high schools, continuation schools, and public schools, when more fully developed, are sure to have a very wholesome influence in stimulating a deeper interest in agricultural problems. These various agencies have as their main objects the securing and the imparting of information, and the development of study and investigation. The co-operative system of the Experimental Union has these same objects in view, and in addition it helps the farmer in applying the information obtained to his own farming operations. It enables the experiment station to co-operate with the farmer in applying some of the principles of agriculture to his own special conditions. It not only tells him about things, but it actually assists in directing his movements in trying to find out for himself how certain things will work out on his own farm, when tested under definite and carefully thought out plans. Its aim is to encourage the farmers of all classes to do better work for themselves and for others than they have been doing in the past. It endeavors to give men a deeper interest in farming, a higher opinion of their occupation, a greater appreciation of their responsibilities, an opportunity of making more money, and the means by which they can take a more prominent part in the progress and development of their country.

The co-operative experimental work is under the direct supervision of the Ontario Agricultural and Experimental Union, and is greatly assisted by the Ontario Agricultural College. The great bulk of the co-operative experiments have been conducted by the farmers themselves upon their own farms. We have now hundreds of trained men throughout Ontario who have successfully conducted experiments on their own farms for five or more years, and even up to twelve or fifteen years. In 1911, the co-operative work was conducted on farms throughout Ontario in agriculture, forestry, apiculture, agricultural chemistry, and in connection with the public schools in elementary agriculture, horticulture, and forestry.

In agriculture alone, the co-operative experiments were conducted on 4,490 farms in 1911. The number of co-operative experiments in agriculture for the twenty-six years, from 1886 to 1911 has been 63,302. There were no less than

forty separate experiments which covered all the most important farm crops in the Province of Ontario, and which dealt with varieties of crops, mixtures of grains and grasses, application of commercial fertilizers and farmyard manures, and quantities of seed per acre.

In horticulture, co-operative experiments were conducted for a series of years, but in 1911 the work was dropped temporarily. It is expected that work in this department will be continued again in 1912.

In the department of agricultural chemistry, some new work was started in 1911 in testing commercial fertilizers with vegetables and with small fruits.

In the departments of apiculture and forestry, progressive work was accomplished during the past year, the results of which will be found in this report.

For three years in succession, the schools division of the Experimental Union has been developing a system of experiments and object lessons in connection with the public schools of Ontario. This work has been very highly commended by a number of outsiders who have learned of the methods which have been adopted and of the progress of the work.

About 30,000 copies of the Annual Report of the Experimental Union for 1910 have been printed and distributed by the Ontario Department of Agriculture. Besides this wide distribution of the reports of the experiments, we are pleased with the interest which has been taken in our Union meetings by the editors of the agricultural journals and by the agricultural editors of several of our leading newspapers of Ontario, and even in some of the other provinces. It will, therefore, be seen that the results of the co-operative experiments of the Ontario Agricultural and Experimental Union are receiving a very wide publication. We are pleased with the continued and substantial growth of this Association, and believe that it has even a wider place to fill in the future than it has in the past in the advancement of Ontario's agriculture.

F. W. Goble (Vice-President): I am sure it is not necessary, after Prof. Zavitz's report, to make any comment upon the work of the Experimental Union. It is impossible to estimate the influence of the work done in years past, and as Mr. Zavitz says, we are going on to greater things in the future. I am sure we are all very sorry that the President (Mr. W. J. Lennox) is not able to be present with us to-day. He is at the present time in the United States, and I am acting as his substitute. He has sent his address, and I am only sorry that he is not here to give it in person.

PRESIDENT'S ADDRESS.

W. J. W. Lennox, Newton Robinson.

Allow me to express my deep regret at not being able to be present at this, the thirty-third anniversary of the Ontario Agricultural and Experimental Union.

We, who are unable to be present at this convention, will anxiously await the report of the meetings. We are most desirous of the knowledge which is to be gained from the results of the co-operative experiments.

We are glad to welcome the visitors, officers, ex-students, and students of the College. We hope to have large and enthusiastic audiences. We trust that each attendant will accept our cordial invitation to take part in the discussions and thus assist in making this visit both pleasant and profitable.

The meeting of the Experimental Union each year has proven more interesting and instructive than the previous one. We hope this year may break all previous records and be recorded as the greatest in the history of the association.

It is a regrettable fact that many of the ex-students are unable to be present at the annual meeting. It is a time to meet old friends and to renew acquaintances. If it were possible to have more of the ex-students present we would have a greater re-union and possibly more enthusiastic discussions. Their presence would greatly encourage Prof. Zavitz and the other members of the College staff, who have devoted so much of their valuable time to the Experimental Union.

To show our appreciation of the work done by members of the College staff, we must in some way increase the number of ex-students in attendance at the annual meeting. The annual banquet proved most satisfactory while our number was small. We have now outgrown this banquet. It has been quite fittingly replaced by the O.A.C. ex-students' re-union at the home of Dr. and Mrs. Creelman. The ex-students who have gathered there have highly appreciated their visit to the College and the re-union of old boys.

However, we find a limit to the re-union of the older ex-students. We find it necessary that the ex-students of different years be united and that these become acquainted with the new members of the staff and the students in attendance at the College. We could have a grand re-union in the gymnasium. We believe the number would be considerably increased if it were given as a later number on the programme. We would all be in town for that occasion and help to make it one of the most interesting numbers on the programme.

The change of the time of meeting from December until January has been beneficial. The officers are at liberty to devote more time to the preparation of the charts and conclusions drawn from the results of the co-operative experiments. The students of the College have finished the mid-term examinations, and they are thus enabled to take a greater interest in the meetings. The ex-students are relieved from inducements of the Fat Stock Show, and the members of the Short Course are given an opportunity to receive the reports of the experiments. The result is that we have very large and enthusiastic audiences at our meetings.

There is such a close connection between the different agricultural organizations that we cannot hope to arrive at the estimate of the work done by a special department. We are, however, confident of the fact that we have had a great revival in agriculture; old orchards have been renewed; wet lands have been reclaimed; live stock has been improved; crops have been increased; in fact, agricultural education is now essential in the development of the minds of the young and rising generation.

We have, at length, directly interested the city business man in agriculture. He is becoming quite anxious to receive the products direct from the farm. He is purchasing land and is acquainting himself with the general knowledge of our business. We hope the result may be that he, too, will assist us in our earnest efforts to co-operate, and that we may shortly stand for our rights and receive what we should from the consumers of our products.

We, the practical farmers of the Province of Ontario, need to unite in our efforts for Agricultural improvement more than ever before. We have made rapid growth during the past few years. We have demonstrated the fact that in union there is strength. Let us then make haste to protect ourselves more strongly by proclaiming "Co-operation and Union" and by clinging closely to this motto until we are fully represented in parliament and exercise our rightful influence in the management of the affairs of our country.

Hon. Mr. Monteith: The value of this address given by the Vice-President for the President largely comes from a discussion of it. There are a few points that seem to impress themselves upon me. He makes mention of the fact that there is a revival in agriculture. Upon what is that idea founded? Is it because more people are rushing to the cities that agriculture is reviving? Is it because our classes at this institution have so largely increased? One, apparently, is almost a seeming contradiction of the other. However, the two are true. Men are leaving the land, and men are seeking institutions such as we have here to fit themselves the better to take more out of the land, and as a natural result, we will suppose, to fit themselves to produce a greater amount of food product for their labor. Now, it is in my humble opinion, possibly a little early to say there is a revival in agriculture. There is undoubtedly a revived interest in what might be known as the more scientific side of agriculture. Men are going into this great question and attacking it from a great many viewpoints that were unthought of years ago. We are taking up the matter of more intensive methods. We are possibly co-operating to a greater extent than ever before. Now, how far can we follow these lines and make good, is the question. Our educational system at the present time is being shaped to some extent to give us a greater love for our surroundings. There is an attempt, happily inaugurated at this very institution, at the Experimental Union, to touch the basic foundation of our agricultural system, namely, the educational system of the public school. I believe that if we can interest the child at the public school and give him a reasonable working knowledge of the principles underlying crop production, we will have in truth a revival in agriculture in this Province. But so long as we have as the goal of our ambition merely the accumulation of dollars and cents I do not look for any very serious revival in agriculture. The prices paid for labor in the industrial centres are such that they would make young men think that money is our sole interest and object in life. And for that reason if we can lead the children in the public school to appreciate to the full the advantages that they have, then we will have begun this revival in agriculture, and not until then. This College is doing much in sending out men who are enthusing our teachers throughout the Province to begin, I believe, at the right place. I trust that this work will go on. I do not wish particularly to criticise the address other than to question the revival in agriculture, believing that our progress in that line at present is not marked.

RESULTS OF CO-OPERATIVE EXPERIMENTS IN AGRICULTURE.

C. A. Zavitz, Professor of Field Husbandry, O.A.C., Guelph.

The committee on agricultural experiments has been active during the past year and is able to report a slightly increased number of experimenters over that of 1910. During the past year there were in all, forty distinct and separate co-operative experiments in agriculture conducted throughout the Province. The demand for these experiments vary greatly, for one of them there were only two applications, and for another there were 1,045. No less than 4,490 farmers took an active part in conducting experiments in agriculture upon their own farms during the past year. This number was slightly greater than that of 1910.

I wish to draw particular attention to the excellent work which the experimenters are accomplishing, not only for themselves but also for the agriculture of our Province. Besides the associates and the graduates of the College who are now farming in Ontario and are taking a deep interest in the work of the Experimental Union, we are pleased to state that a large number of leading and influential farmers of Ontario who have never had an opportunity of attending an Agricultural College, are also doing most commendable work. Several hundreds of these experimenters have conducted co-operative work successfully on their own farms for each of at least five years and are therefore specially trained for even better work in the future.

The great bulk of the co-operative experiments have been conducted by the farmers themselves upon their own farms. Officers and members of the Farmers' Institutes and of Farmers' Clubs, in some instances, have united in carrying out a number of co-operative tests in connection with their local organizations. Some of the Public School inspectors have encouraged this work in their various school sections either in the school grounds or at the homes of the pupils living near the school buildings. Nearly all of the graduates of the College who have been appointed County representatives and who are now located in about twenty of the counties of Ontario, have carried on quite extensive work according to the instructions and with the material furnished by the Experimental Union.

The Experimental Union opens up a channel through which some of the best material of the Experiment Station can be brought to the homes of the farmers. It makes direct application of the information gained at the college by having experiments conducted on hundreds and even thousands of farms, and it systematizes the co-operative work in such a way that the results of those experiments which have been conducted with care and accuracy can be summarized and made into valuable reports for the guidance of farmers generally. It introduces improved methods of farming along various lines. It combines, in an admirable way, the training of the hands and the training of the intellect. It is therefore not only a source of practical gain in dollars and cents to the farmers, but it is a great educational feature which has had a very wholesome influence, not only on the agriculture of the Province, but also on the agriculturists themselves.

For the co-operative work which is being carried on throughout Ontario, the results of experiments and investigations obtained at the Agricultural College, form the basis of both the methods of operation and the materials selected. Close attention has been given to the methods of conducting experiments, and printed instructions for conducting the tests, along with blank forms on which to report the results, have been forwarded to every person undertaking the work. From the beginning, the co-operative experimental work of the Union has been directed and controlled by circulars and letters, printed and written, which have been transmitted through the mails. Personal letters have frequently been sent to give encouragement and advice. When special visits have been made to the experimenters, the object has been to enable the directors to study the difficulties of those actually engaged in the work and thus to be in a better position to know the best methods to adopt in the printed instructions rather than to take any part in the immediate control of the practical operations of the experiments. We believe that this is a wise move, as it places the men upon their honor and tends to bring out the best that is in them. Every man is made responsible for his own experiments and is urged to do the very best he can for himself, for his neighbors, for the Experimental Union, and for the country. A pleasing feature in connection with this work is the fact that many persons, who at first took but little interest in the

experiments, have afterwards proven themselves to be most valuable experimenters and have shown great care and accuracy in the details of their work. Great care is exercised in planning the various co-operative experiments in such a way that they can be successfully undertaken by the people who are to be benefited thereby. Some experiments are comparatively simple and some are more complicated, but in every case the work is made as clear of comprehension, as definite of purpose, and as simple in method of operation as is consistent with the objects in view. It has been the constant aim to make all experiments as interesting and as instructive as it is possible to make them.

The forty experiments in agriculture conducted in 1911 included those with spring and fall grains, root crops, forage, fodder, silage and hay crops, culinary crops, the growing of grains, grasses and clovers in different combinations, different quantities of grain per acre, the application of commercial fertilizers, farmyard manures, etc. Most of the plots were one rod wide by two rods long, being exactly one-eightieth of an acre in size. Formerly, some of the plots were considerably larger, a few being as large as one-half of an acre, but these gave less satisfaction than the smaller plots. It is indeed a difficult matter for the experimenters to give accurate weights of crops if they are produced on large sized plots. With the smaller plots, the experiments can be kept more completely under control, and more definite results can be obtained.

At the Agricultural College at Guelph, the autumn of 1910 was comparatively moist, the winter was early and fairly steady, but the snowfall was somewhat lighter than usual. In 1911, the month of March was fine, the early part of April was cold and disagreeable but the latter part of the month was favorable for seeding, May was pleasant, June was comparatively dry, and July was excessively hot and somewhat dryer than usual. The hot weather in July was quite general throughout the Province. The amount of rainfall, as determined by the Department of Physics at the College for the growing months of 1911, was as follows: April, 1.67 inches; May, 1.64 inches; June, .89 inches; July, 1.95 inches; and August, 2.53 inches. According to the Crop Bulletin of the Bureau of Industries of the Ontario Department of Agriculture, the average rainfall throughout Ontario in each of the growing months during the past season was as follows: April, 1.93 inches; May, 2.17 inches; June, 2.30 inches; July, 2.19 inches; and August, 2.10 inches. The rainfall in each of the months here mentioned for 1911 is less than the rainfall for Ontario for the corresponding months in the average of the past twenty-nine years. It will therefore be seen that the weather conditions were very severe both at the Agricultural College and throughout Ontario during the past season, and in consequence of these conditions, the yields of most crops are somewhat below the averages of past years.

List of Experiments for 1911.

Grain Crops.

	PLOTS
1 —Testing three varieties of Oats	3
2a—Testing three varieties of six-rowed Barley	3
2b—Testing two varieties of two-rowed Barley	2
3 —Testing two varieties of Hulless Barley	2
4a—Testing two varieties of Spring Wheat	2
4b—Testing two varieties of Spring Rye	2
5 —Testing two varieties of Buckwheat	2
6 —Testing two varieties of Field Peas	2
7 —Testing Emmer and Spelt	2
8 —Testing two varieties of Soy, Soja, or Japanese Beans	2
9 —Testing three varieties of Husking Corn	3

Root Crops.

10 —Testing three varieties of Mangels 3
11 —Testing two varieties of Sugar Beets for feeding purposes 2
12 —Testing three varieties of Swedish Turnips 3
13 —Testing two varieties of Fall Turnips 2
14 —Testing two varieties of Carrots 2

Forage, Fodder, Silage and Hay Crops.

15 —Testing three varieties of Fodder and Silage Corn 3
16 —Testing three varieties of Millet 3
17 —Testing two varieties of Sorghum 2
18 —Testing Grass Peas and two varieties of Vetches 3
19 —Testing Rape, Kale and Field Cabbage 3
20 —Testing three varieties of Clover 3
21 —Testing two varieties of Alfalfa (Lucerne) 2
22 —Testing four varieties of Grasses 4

Culinary Crops.

23 —Testing three varieties of Field Beans 3
24 —Testing three varieties of Sweet Corn 3

Fertilizer Experiments.

25 —Testing fertilizers with Potatoes 8
26 —Testing fertilizers with Mangels 10
27 —Testing fertilizers with Barley 10

Miscellaneous Experiments.

28a—Testing two varieties of Early Potatoes 2
28b—Testing two varieties of Medium ripening Potatoes 2
28c—Testing two varieties of Late Potatoes 2
29 —Testing three grain mixtures for Grain production 3
30 —Testing three grain mixtures for Fodder production 3

Autumn Sown Crops.

31 —Testing three leading varieties of Winter Wheat 3
32 —Testing two leading varieties of Winter Rye 2
33 —Testing five Fertilizers with Winter Wheat 6
34 —Testing Autumn and Spring Applications of Nitrate of Soda and Common Salt with Winter Wheat 5
35 —Testing Winter Emmer and Winter Barley 2
36 —Testing Hairy Vetches and Winter Rye as Fodder Crops 2

Although the weather conditions in many parts of Ontario were quite unfavorable for high yields of crops, it has, however, been an interesting year to watch the progress and the results of the experiments under trying conditions. The reports of the co-operative experiments for 1911 which have been received have been submitted to a very critical examination. For the following summary, only the results given in those reports which were complete in essential features and showed carefulness and reliability throughout were used. Many of these reports have been furnished by men who have had a large amount of practical experience on the farm, have had the advantages of a good education, and have had a careful training in experimental work, as they have conducted successful tests on their own farms in each of several years in the past. It should be remembered, however, that while only the good reports of carefully conducted experiments have been used for publication, many of those not included in the summary showed that the individual experimenters must have obtained a considerable amount of value from the work. It frequently happens that, owing to some unavoidable accident,

the experiment may have been injured to some extent so that the results could not be used in the general summary and yet the experiment may have furnished useful lessons to the farmer conducting it. In all cases, experimenters obtain much more information from the work which they conduct than can be given in a summary report.

In the carefully arranged instructions for conducting the co-operative work which were furnished each experimenter, a request was made for the experimenter to give his decision as to the relative standing of the different varieties, mixtures, quantities of seed, fertilizers, manures, etc., after everything had been taken into consideration. The summary of the answers to this line of inquiry is presented in the tabulated results under the heading of comparative value.

Grain Crops.

There were in all about six million acres of grain crops in Ontario in the year 1911. Frequently, we hear stockmen making the statement, that the day of grain growing in Ontario has passed. It scarcely needs to be mentioned that a statement of this kind is entirely wrong. There was never a time when there was more grain grown in Ontario than at present. It is, of course, true that a very much larger percentage now grown in Ontario is fed on the farms than formerly. This has been brought about largely through the development of the livestock industry. It is of the utmost importance that great attention be given to grain growing at the present time, whether or not the crop is to be used on the farm or to be sold in the markets. The objects in grain growing at present, in a number of instances, are different from those of former years. Formerly, when grain was grown for sale, it was important to grow those varieties which would meet with a ready sale on the market, as for instance, in growing oats it seemed to be important to furnish grain of good appearance and which weighed well per measured bushel. When the oats are largely grown for feeding on the farm, however, those varieties should be selected which will give large yields of oats of good quality. It has been found that those oats which give the best results on the farm, when quality and quantity are both taken into consideration, are frequently not the oats which will bring the highest price on the market. For a fuller development of this phase of the subject the reader is referred to the report of the Professor of Field Husbandry in the Annual Report of the Ontario Agricultural College for 1911. Again, in barley production, one of the main objects in view at present is to produce large yielding varieties which will furnish grain of good quality for feeding purposes rather than grain particularly suitable for brewing purposes to be exported to the United States and with little reference to the yield per acre. The farmer of the present day should be abreast of the times in changing his methods of farming to meet the new conditions in the best possible way. One of the greatest weaknesses in Ontario at the present time is the fact that many of the farmers have not realized the numerous changes which are necessarily taking place in the agriculture of Ontario, and are consequently behind the times in their views of farming and in their methods of operation. To illustrate this point, it might be stated that probably a great majority of farmers would give preference to a variety of oats which would weigh forty pounds per measured bushel as against another variety which would weigh thirty-four pounds per measured bushel, and the chances are that the former would contain from thirty to thirty-six per cent. of hull and the latter from twenty-four to twenty-eight per cent. of hull. Formerly, the market demanded an oat which weighed heavy per measured bushel, and farmers, generally got the impression that

the variety of oats which would weigh the heaviest per measured bushel was consequently the best oat, while it might have been the very poorest. The time has come when farmers should pay more attention to real worth and less attention to mere appearance and to popular opinion. Surely it is unwise for a farmer not to take the greatest advantage which he can from the results of experiments conducted at our public institutions; such as, the Ontario Agricultural College and the Central Experimental Farm, and also from the results and the conclusions of the experiments carried out through the medium of the Ontario Agricultural and Experimental Union.

GRAIN CROPS, 1911.

Experiments.	Varieties.	Comparative Value.	Yield per Acre.		
			Straw (tons).	Grain (bus.).	Grain (lbs.).
Oats (87 tests)	O. A. C. No. 72	100	1.25	39.81	1,354
	Siberian	88	1.33	38.73	1,317
	Regenerated Abundance	95	1.13	38.20	1,299
	Lincoln	74	1.13	34.82	1,184
Six-rowed Barley (33 tests)	Emmer	80	1.08	.....	1,331
	O. A. C. No. 21	100	1.06	27.67	1,328
Hulless Barley (9 tests)	Guy Mayle	100	1.88	23.37	1,402
	Black Hulless	82	1.53	21.21	1,273
Spring Wheat (14 tests)	Wild Goose	100	1.19	19.60	1,176
	Hungarian	79	1.07	16.73	1,004
Emmer and Spelt (3 tests)	Common Emmer	100	.62	34.34	1,374
	Alstroum Spelt	53	.48	21.00	840
Buckwheat (2 tests)	Rye	100	1.36	15.30	734
	Silver Hull	95	1.71	10.98	527
Winter Wheat (24 tests)	American Banner	96	1.21	23.80	1,428
	Imperial Amber	100	1.20	23.34	1,400
	Tasmania Red	91	1.20	23.00	1,380
	No. 5 Red	65	1.20	20.73	1,244
	Crimean Red	57	.96	19.18	1,151
Winter Rye (2 tests)	Mammoth White	100	2.91	24.83	1,390
	Common White	67	3.00	21.43	1,200
Spring Rye (7 tests)	O. A. C. No. 61	100	1.04	17.91	1,003
	Common	67	1.06	16.33	914
Field Peas (27 tests)	New Canadian Beauty	100	1.35	17.89	1,074
	Early Britain	82	1.05	17.84	1,070
Field Beans (19 tests)	Marrowfat	95	1.22	18.59	1,115
	New Prize Winner	92	1.07	18.25	1,095
	White Wonder	100	1.10	17.91	1,074
			Whole Crop.		
Corn for Grain (16 tests)	Early California Flint	100	5.98	47.63	2,667
	Genesee Valley	58	6.18	42.90	2,402
	Wisconsin Little Dent	82	4.91	41.94	2,349
Sorghum for Grain (3 tests)	Early Minnesota Sugar Cane	100	10.04	36.12	1,734
	Early Amber Sugar Cane	90	5.93	34.45	1,654

The results here presented in tabulated form give the average of the successfully conducted experiments with grain crops throughout Ontario in 1911. The figures in the column under comparative value are made up from the answers received from the experimenters in regard to the varieties, after they have taken everything into consideration. The yield of straw, as given in the second column, represents the total crop less the amount of grain and therefore includes the chaff with the straw. The yield of grain is given in pounds as well as in bushels per acre in order that the results may be more clearly understood and that comparisons may be made between the different classes of crops as well as between the varieties of each class. While it is true that the different classes of crops were grown on different farms throughout Ontario, yet as most experiments were conducted in a large number of localities, the complete table enables one to make a fairly good comparison of the yields of the different classes as well as of the different varieties of crops throughout the Province for the year in which the experiments were conducted. Owing to the great variation in the weight per measured bushel of the different crops, it is much easier to compare the results in pounds than in bushels per acre. It should be understood that in working out the number of bushels per acre the standard weights per bushel has been used in each class of crops.

Varieties of Oats. The average area devoted to the growing of oats in Ontario for the last thirty years has been 2,219,669 acres, and that for 1911 was 2,699,230 acres. It will therefore be seen that the oat crop is an exceedingly important one in the Province of Ontario. About two hundred and seventy varieties of oats have been under experiment at the Ontario Agricultural College within the past twenty-three years. New varieties have been introduced from time to time and after five years' tests, the poorer kinds have been dropped and those which have given the best results have been retained in the test.

From an inquiry made throughout Ontario in 1911, it was found that the most extensively grown varieties of oats in the Province were the Banner and the Siberian. Following these two varieties, the Ligowa, Sensation, Twentieth Century, Irish White, and Silver Mine follow in order. No other variety was mentioned as being the most extensively grown in the counties more than two or three times. The Banner and the Siberian were mentioned as being the most extensively grown more times than all the other varieties combined, although in all, twenty-nine varieties were mentioned.

The O.A.C. No. 72 variety of oats was distributed for co-operative experiments in 1911 for the first time. This is the first occasion that it has been grown in any other place than at the Ontario Agricultural College. This variety of oats was originated from a single plant which was selected from nearly 10,000 plants of the Siberian variety which were grown separately in a nursery plot in 1903. It has made an excellent record at the College, surpassing in average yield per acre for the last five years the Siberian, Banner, Sensation, Ligowa, Abundance, and other prominent varieties. In the co-operative experiments over Ontario in 1911 it surpassed the other varieties with which it was compared, in average yield of grain per acre as follows: Siberian, 1.1 bus.; Regenerated Abundance, 1.6; and Lincoln, 5 bus. It occupied an intermediate place between the Siberian and the other two varieties in straw production. Of the four varieties under competition over Ontario during the past year, the O. A. C. No. 72 was the most popular with the experimenters. According to the reports which they furnished, it produced stiffer straw was freest from the rust of the four varieties under test. The weakest strawed variety was the Lincoln, and the variety which had the most rust was the

Abundance. It looks as if this new introduction would be a valuable variety of oats for Ontario, and if it continues to give as good results in the future as it has at the College during the past few years, and as it gave in the co-operative experiments over Ontario in 1911, it will likely take the place of a large number of varieties that are now grown to a limited extent, and may in a short time come in competition with the Banner and with the Siberian for first place. The Siberian variety of oats, which stands second in the co-operative experiments over Ontario in 1911, was introduced by the Ontario Agricultural College from Russia in the spring of 1889. The Regenerated Abundance was introduced a few years ago by the Garton Bros., England, the same firm which introduced the Storm King, the Tartar King, the Pioneer, etc. Of all the varieties of oats which have been introduced by this firm, the Regenerated Abundance has made the best record in the experiments at the College. The Lincoln variety of oats was imported by the College from the United States a number of years ago, and was tested in our experimental grounds for several seasons. It is an oat of fine appearance when growing, and the grain is very attractive and is of fairly good quality. The yield of this variety, however, has not been very high either at the College or in the co-operative experiments over Ontario. It will be seen that in the average results throughout the Province for 1911, the Lincoln gave five bushels per acre less than the O. A. C. No. 72. This difference in yeild per acre, if applied to the area used for oats in Ontario in 1911, would mean a difference of 13,496,150 bushels in favor of the O. A. C. No. 72 in comparison with the Lincoln variety.

Six-rowed Barley. The records furnished us by the Bureau of Industries in Toronto for the last thirty years, as well as those of the Agricultural College and of the Experimental Union for a series of years show that, on the whole, six-rowed barley has given a greater number of pounds of grain per acre than oats, when the averages are taken into consideration. It will be seen, however, that in 1911 the O.A.C. No. 72 variety of oats gave a little higher yield of grain per acre than the O.A.C. No. 21 barley. It will, however, be observed that the O.A.C. No. 21 barley gave a greater yield of grain per acre than the Siberian, Regenerated Abundance, and Lincoln varieties of oats.

In the spring of 1911 only one variety of six-rowed barley was distributed. As Emmer has proven to be a high yielder of grain in Ontario, the competition was made between the Emmer and the O.A.C. No. 21 barley, and in the average of thirty-three reports of successfully conducted experiments it will be seen that the Emmer surpassed the O.A.C. No. 21 barley by three pounds per acre. As this difference is so very slight, they might be considered practically equal in yield per acre for the past year. For general worth, however, the experimenters preferred the O.A.C. No. 21 barley as against the Emmer as a farm crop. The O.A.C. No. 21 barley was originated at the Ontario Agricultural College from a single plant selected from about 10,000 plants of the Mandscheuri barley grown separately in a nursery plot in 1903. It has been distributed in connection with the co-operative experiments throughout Ontario in each of the past five years and has made a very excellent record indeed. In the Annual Report of the Experimental Union for 1910, it is stated that:

"The O.A.C. No. 21 barley has been particularly free from the attacks of the rust, not only in 1910, but also in the co-operative experiments for the three years previous, and in the experiments at the College. This barley was also a little stiffer in the straw than either the Emmer or the Spelt throughout Ontario in 1910. Some experimenters referred to the Success barley as being slightly

affected with the smut, but no reports were received of smut occurring in either the Emmer or the O.A.C. No. 21 barley."

This barley again made an excellent record in regard to strength of straw and to freedom from rust in the co-operative experiments of 1911.

It is interesting to know that during the comparatively short time that the O.A.C. No. 21 barley has been introduced throughout Ontario in connection with the Experimental Union, it has increased rapidly, that it is now grown quite extensively, and that it is rapidly supplanting even the noted Mandscheuri barley which was introduced by our College in the spring of 1889. In the 1911 competitions of standing fields of barley, as entered by the agricultural societies of Ontario, of the threshed grain as exhibited at the National Exhibition at Toronto, and of the threshed grain as exhibited both in the open classes and in connection with the agricultural societies' exhibit at the Provincial Winter Fair at Guelph, all prizes were awarded to the O.A.C. No. 21 barley. It is probably safe to say that, according to the results at the College and throughout Ontario, the O.A.C. No. 21 barley is the best variety of six-rowed barley under cultivation in the Province at the present time.

Two-rowed Barley. Two-rowed barley is grown only to a very limited extent in the Province of Ontario, although it is the leading class of barley grown in England, France, and Germany. Experiments in general practice show that the varieties of six-rowed barley considerably surpass in yield per acre the varieties of two-rowed barley when grown in the Province of Ontario. In the spring of 1911, two of the best varieties of two-rowed barley were selected for the co-operative experiments, but the demand for these was very limited and no satisfactory reports have been obtained from the experimenters.

Hulless Barley. There is still interest taken in the production of hulless barley in Ontario. We have tested in all, some fifteen varieties of hulless barley, at the College. These have been obtained from a number of different countries. The Black Hulless is the oldest and probably the best known variety in Ontario. The Guy Mayle hulless barley has surpassed the Black Hulless in yield per acre and in strength of straw in the experiments at the College. In the co-operative experiments throughout Ontario in 1911, of which we have received nine good reports of successfuly conducted tests, the Guy Mayle barley surpassed the Black Hulless by fully two bushels per acre. It was also the heaviest producer of straw and the more popular variety with the experimenters.

Spring Wheat. Fourteen good reports of successfully conducted experiments with spring wheat have been obtained. Of the two varieties under competition, the Wild Goose surpassed the Hungarian by nearly three bushels per acre. The former also surpassed the latter variety in yield of straw and in popularity. The Wild Goose variety is a coarse wheat and is frequently used for the manufacture of macaroni, and the Hungarian is a bearded wheat with a red chaff, and grain of good milling quality.

Emmer and Spelt. These represent two distinct types or species of wheat which have been grown for long periods of time in some of the Eastern countries. It is only recently, however, that attempts have been made to grow these grains in general cultivation in this country. One of the peculiarities of these wheats is the closeness with which the chaff adheres to the grain. When threshed, there is not a clear separation of the grain and the chaff, but both come from the machine together. When they are used for feeding purposes, the grain can be fed whole or can be ground into meal. The chaff of the Spelt is about equal to the hull of

the oats, but that of the Emmer is only about two-thirds as great. Both Emmer and Spelt have been distributed throughout Ontario for co-operative experiments in each of the past eight years, the following being the yields per acre from the two varieties respectively: 1904, 2,274 lbs., 1,263 lbs.; 1905, 1,589 lbs., 1,276 lbs.; 1906, 1,578 lbs., 1,106 lbs.; 1907, 1,768 lbs., 952 lbs.; 1908, 1,731 lbs.; 1,002 lbs.; 1909, 1,815 lbs., 1,190 lbs.; 1910, 1,374 lbs., 1,314 lbs., and in 1911, 1,374 lbs. and 840 lbs. It will, therefore, be seen that the Emmer has surpassed the Spelt in yield of grain per acre in every one of the past eight years. In both the experiments at the College and in the experiments throughout Ontario, the Emmer forms a close rival to the best varieties of oats and the best varieties of barley in yield per acre. In 1910, the Emmer was surpassed considerably by the O.A.C. No. 21 barley, and in 1911 the latter was surpassed by the former by an average of three pounds of grain per acre. Taking the last two years into consideration in which these two kinds of grain have been in competition, it will be seen that the O.A.C. No. 21 barley has surpassed the Common Emmer in yield of grain per acre.

Buckwheat. For four years in succession, the Rye buckwheat has surpassed the Silver Hull in yield of grain per acre throughout Ontario. The Rye buckwheat is grown quite extensively in Nova Scotia, but it has not as yet been brought into general cultivation in our Province. In the experiments at Guelph it has surpassed all other varieties in yield of grain per acre during the past six years. The Rye buckwheat, as compared with the Silver Hull, has a somewhat finer straw and a flour which is more yellow in color.

Winter Wheat. In the autumn of 1910, five varieties of winter wheat were distributed for co-operative experiments throughout Ontario. As the average of twenty-four reports, the American Banner comes at the head of the list with 23.8 bushels per acre. This variety, however, was followed closely by the Imperial Amber and the Tasmania Red. The American Banner variety resembles very closely the Dawson's Golden Chaff. It is very stiff in the straw and has a beardless head, red chaff, and white grain which is somewhat soft and is only fair in the production of flour for the manufacture of bread. The Imperial Amber is a wheat which yields very well and produces grain which is above the average in milling quality. Of all the wheats which have been tested at Guelph for bread production, the Crimean Red and the Tasmania Red are amongst the best.

Winter Rye. The Mammoth White winter rye has been a leader in grain production both at the College and in the co-operative experiments. The Mammoth White variety has headed the list in yield of grain per acre in seven out of the past eight years which it has been grown at the College.

Spring Rye. A co-operative experiment with spring rye was conducted in 1911 for the first time. In 1901, when the writer was in Germany, he made a special trip of about seventy-five miles to visit the most extensive rye breeder in that country. From him he obtained a small quantity of the Petkos rye. This gave very poor results at first, but has gradually improved. A few of the best plants were selected and new strains were started, and the one which has given the best results was distributed in the spring of 1911 for competition with the Common rye throughout Ontario. As the average of seven carefully conducted experiments, we find that the O.A.C. No. 61 rye surpassed the Common variety by nearly one hundred pounds of grain per acre.

Field Peas. In each of the past six years we have distributed peas for co-operative experimental purposes. In most of these years the Early Britain has made

the highest record. In the last two years, however, it has been slightly surpassed by the New Canadian Beauty. The New Canadian Beauty is a large, white, smooth pea, and the Early Britain is a brown pea but of excellent quality. The Early Britain does particularly well where a straw of medium length is required, while the New Canadian Beauty will thrive on a poorer soil where a longer strawed variety is desirable.

Field Beans. In 1911, 25,687 acres of field beans were grown in Kent county and 9,046 acres in Elgin county. More than one-half of the area grown with field beans in Ontario is confined to these two counties. From amongst thirty varieties of beans which have been grown under test for several years at the College, three varieties were selected for co-operative experiments in the spring of 1911. As the result of nineteen successfully conducted experiments, it was found that the Marrowfat gave the highest, the New Prize Winner the second, and the White Wonder the lowest yield of grain per acre. The White Wonder has done very well in the co-operative experiments in former years, but did quite poorly in the severe season of 1911. Both the White Wonder and the New Prize Winner varieties are earlier in reaching maturity and possess a shorter straw than the Marrowfat variety. The weather conditions of the past year were apparently quite favorable for the Marrowfat beans in comparison with the other varieties.

Soy Beans. A large number of soy beans have been under test at the Ontario Agricultural College. Nearly all of these have required too long a season of growth to prove satisfactory in this climate. A few of the varieties, however, usually mature the seed and have proven worthy of further investigation. Two of the earliest varieties were distributed for co-operative experiments in 1911. The demand, however, for this experiment was light, and the meagre results obtained do not furnish sufficient material for presentation in a tabulated form. The Early Yellow variety made the best record in Ontario in 1911. This variety has proven the best at the College over a series of years. A selection from the Early Yellow variety, however, which has been made at the College, is promising and may be introduced in the co-operative work in the near future.

Corn for Grain Production. Of the 644,000 acres of corn grown in Ontario in 1911, fully 300,000 acres were used for the production of grain. As the different varieties of corn vary so much in the time which they require to reach maturity, etc., many of them are quite unsatisfactory for grain production in this Province. The three varieties which were selected for distribution for co-operative work in the spring of 1911 were all comparatively early maturers and high yielders of grain, as shown in the experiments at the Ontario Agricultural College. The Early California Flint was obtained from L. P. Gunson & Co., Rochester, N.Y.; the Genesee Valley from Jas. Vick's Sons, Rochester, N.Y.; and the Wisconsin Little Dent was grown in Southern Ontario. In average yield of grain per acre for the past five years of each of twelve varieties grown for grain production at the College, the Early California Flint came first, the Wisconsin Little Dent second, and an early strain of the White Cap Yellow Dent third. The Yellow California Flint is an early variety which produces corn of a yellow color and ears with twelve rows. It is, therefore, somewhat similar to the Compton's Early, but has given better results. In the average tests made at the College for five years, the California Flint has surpassed the Compton's Early by thirteen bushels of shelled grain per acre per annum. When examining the results of the whole crop per acre in the tabulated records here presented, it should be remembered that

these are comparatively early corns and were grown for grain production, and that the crops were considerably dried when the weighings were made, and the weights would necessarily be less than those of varieties of fodder corn grown for green crop production.

Sorghum for Grain. About twenty varieties of sorghum have been under experiment at the Ontario Agricultural College. These have included different kinds of sugar cane, broom corn, kaffir corn, millo maize, etc. Some of the varieties of sugar cane are now grown in certain sections of Ontario with a good deal of satisfaction for the production of either green or dry fodder, and to a limited extent for mixing with oats and red clover for the production of a temporary pasture. Two varieties of sugar cane were distributed throughout Ontario in the spring of the present year. The tabulated results will show that the yield of seed per acre of the sugar cane surpassed the yield of all other grains under experiment with the exception of the corn. The Early Minnesota Sugar Cane gave a higher yield of total crop and of seed than the Early Amber variety. Unfortunately, however, the seed of the Early Amber Sugar Cane, which was used in 1911, was a little week in germination. The Early Minnesota variety was later than the Early Amber in reaching maturity. As far as total yield per acre was concerned, the early Minnesota considerably surpassed the total yield of the corn, and the Early Amber variety about equal to that of the highest yielding variety of corn. When experiments of other years are taken into consideration in regard to crop production and earliness in maturing, the Early Amber Sugar Cane is probably equal, or it may be slightly better than the Early Minnesota variety for use in Ontario.

Mixtures of Grain for Grain Production. A large amount of carefully conducted experimental work has been carried out at the Ontario Agricultural College during the past few years, not only in testing different varieties of farm crops, but also in testing different varieties and different classes of farm crops when grown in combination. It has been found but little advantage to grow in combination two varieties of the same kind of grain. It has also been found that varieties of certain different classes of grain can be grown in combination to marked advantage. The results of experiments show that two bushels of oats and one bushel of peas grown in combination make an admirable mixture for the production of green fodder or of hay. Other experiments show that oats and barley of the right varieties, when grown together in the right proportions, will give a yield of about two hundred pounds of grain per acre more than either one when grown alone.

In connection with the Ontario Agricultural and Experimental Union, co-operative experiments have been conducted with mixed grains throughout Ontario. In 1909, an experiment was conducted with different varieties of oats, barley, and spring wheat which were grown in combinations of two and three kinds of grain together for the fifth year in succession. The results of the five years' experiment showed that throughout Ontario one bushel of the Daubeney oats and one bushel of the Mandscheuri barley gave a higher yield of grain per acre than any of the other mixtures used in this experiment. In 1910, and again in 1911, a co-operative experiment was conducted throughout Ontario in testing three different proportions of oats and barley in order to find out which one would give the largest yield on the average of the different soils of the Province. In 1910 the varieties used were the Daubeney oats and the Mandscheuri barley, and in 1911 the varieties used were the Alaska oats and the O.A.C. No. 21 barley.

The oats and the barley were sown in three different proportions each year, the amount of seed being one-half bushel of each, one bushel of each, and one and one-half bushels of each per acre. The amounts of seed used each year, therefore, of the mixtures were one, two, and three bushels per acre. The following table is the average results of the good reports of successfully conducted experiments of the mixtures of oats and barley in each of the two years, and also for the average of the two-year period:

Varieties and Combinations.	Seed per acre.			Yield per acre.					
	Bus.	Lbs.		Tons of straw.			Pounds of grain.		
				1910	1911	Average.	1910	1911	Average.
Oats	½	17	41	1.32	.75	1.04	1,528	1,420	1,474
Barley	½	24							
Oats	1	34	82	1.47	.93	1.20	2,104	1,820	1.962
Barley	1	48							
Oats	1½	51	123	1.61	1.29	1.45	2,096	1,594	1,845
Barley	1½	72							

From the results here presented, it will be seen that in 1910 and again in 1911 the greatest yield per acre was obtained from sowing a mixture composed of one bushel of oats and one bushel of barley by weight, or a total of 82 pounds of the mixed grain per acre. When this mixture was increased by the addition of one-half bushel of oats and one-half bushel of barley per acre, it decreased the yield 117 pounds per acre. It will, however, be noticed from the results that in the experiments of both years the largest amount of seed used gave the heaviest yield of straw per acre. It is evident that by sowing a large amount of grain in a mixture of this kind a heavy total crop is produced, but that there is not as good a development of the grain. This experiment will likely be repeated in the future co-operative experiments. The number of acres of mixed grain grown in Ontario in 1911 was 486,112. This is an increase of about 15,000 acres over the average of the past five years.

Field Roots, Fodder Crops, Grasses, Clovers and Alfalfa.

In addition to the co-operative experiments with varieties of grain crops, sweet corn, potatoes with different kinds of fertilizers and farmyard manure, with different mixtures and different quantities of seed per acre, etc., others were conducted with mangels, sugar beets for feeding purposes, swede turnips, fall turnips, carrots, fodder corn, sorghum, millet, grass peas, vetches, rape, kale, field cabbage, grasses, clover and alfalfa. The applications for a few of these experiments were somewhat limited and owing to the peculiar weather conditions of the past year a sufficient number of reports in a few instances have not been received so as to present a summary in tabulated form. In the majority of experiments, however, a sufficient number of tests were made with care and accuracy to form results of considerable value. The average number of carefully conducted experiments with the most of these crops are here presented in tabulated

form. It is difficult to get full reports of alfalfa, grasses, clovers, etc., in a way to present in the form of a table. The results of the following table should be of much value as it is difficult to secure information of this kind from any other source:

Experiments.	Varieties.	Comparative Value.	Yield per acre (tons).
Mangels (6 tests)	Ideal (Ontario Seed Co.)	83	25.34
	Yellow Leviathan	100	24.24
	Sutton's Mammoth Long Red	75	23.83
Sugar Beets (4 tests)	Rennie's Tankard Cream	100	24.38
	Bruce's Giant White Feeding	91	23.01
Swede Turnips (2 tests)	Carter's Invicta	100	17.26
	Bruce's New Century	92	16.50
	Rennie's Empress	88	15.96
Carrots (9 tests)	Steele-Briggs Improved Short White	100	13.79
	Simmer's Giant Short White	96	13.50
Fodder Corn (4 tests)	Sterling White Dent	100	11.09
	Hoopengardner's Very Early Yellow Dent	94	10.90
	White Cap Yellow Dent	91	10.28
Grass, Peas and Vetches. (4 tests)	Hairy Vetches	100	7.18
	Common Vetches	79	5.80
	Grass Peas	100	5.56
Millet (4 tests)	Japanese Barnyard	78	6.00
	Hungarian Grass	100	5.47
	Golden Wonder	100	5.00

Mangels. The area devoted to mangels in Ontario during the past few years has been increasing to a limited extent while that for turnips has been decreasing. This change is probably due to the development of the Dairy industry in Ontario for which purpose mangels are more highly recommended than turnips. It is quite probable that in a few years' time mangels will be grown as extensively in Ontario as turnips.

There are four distinct classes of mangels grown in Ontario, viz.; the long, the intermediate, the globe and the tankard. There has been a general impression that the long, red mangels will out-yield all the others in general cultivation. We have found in experiments at the Ontario Agricultural College in recent years that one variety of intermediate and one variety of tankard mangels have surpassed the highest yielding strain of the long red, even though equal numbers of roots have been grown on equal areas of land.

For the co-operative experiments throughout Ontario in 1911, a leading variety of each of three classes of roots was distributed. The Ideal which stands at the head of the list belongs to the tankard class, the Yellow Leviathan to the intermediate class, and the Sutton's Mammoth Long Red to the long red class. The seed of the Ideal variety was produced in Ontario by the Ontario Pioneer Seed Co., and that of the Yellow Leviathan was produced at the Ontario Agricultural College, while that of the Long Red was imported from England. The Yellow Leviathan, although coming a little lower than the Ideal in average yield of roots per acre in the co-operative experiments in 1911, surpassed the Ideal variety in two-thirds of the individual tests. It will also be seen that the Yellow

Leviathan was more popular with the experimenters than either the Ideal or the Sutton's Mammoth Long Red. The Yellow Leviathan variety has now been used in the co-operative experiments for several years in succession. It occupied highest place in average yield per acre in 1904, 1905, 1906, 1907, 1909 and 1910, and second place in yield per acre in 1903, 1908 and 1911. Taking into consideration the comparative yield of the Yellow Leviathan with the other varieties under experiment in past years and the fact that it came the highest in the list in exactly two-thirds of the individual tests in 1911, it occupies the highest place in average yield per acre of all the varieties grown for a series of years.

The College first obtained the Yellow Leviathan from D. M. Ferry, Windsor, Ont., but more recently it has been advertised by nearly all of the principal seedmen of Ontario who issue seed catalogues. In 1909 the Yellow Leviathan seed was obtained from five and in 1910 and 1911 from seven Ontario seedsmen. The seed was carefully examined in the experimental plots at Guelph. In 1911 the seed of this variety obtained from J. A. Simmers, Toronto; Geo. Keith & Sons, Toronto; Jno. A. Bruce, Hamilton; and the Hewer Seed Co., Guelph, produced roots of varying types and which were quite different in shape and in color from those of the Yellow Leviathan variety which had given such good results at the College and throughout Ontario in former years. Of the different lots of Yellow Leviathan obtained from Ontario seedsmen in 1909, 1910 and 1911, the seed obtained from the Wm. Rennie Co., Toronto, was the lowest in germination each year as determined in the field tests at the College. In order to ascertain the vitality of the different lots, four distinct tests were made in 1909 and two in each of the past two years. The seed obtained from D. M. Ferry and Co., Windsor, Ont., gave very satisfactory results until 1911, in which year part of the seed obtained gave very good germination but part of the seed was low in vitality. The seed of the Yellow Leviathan used in the co-operative experiments in 1911 was grown at the College, while that used in the co-operative experiments for other years was obtained from D. M. Ferry & Co., Windsor, Ont.

Sugar Beets for Feeding Purposes. Sugar Beets are grown for two distinct purposes, one for the production of sugar and one for feeding to farm stock. One produces roots which grow almost entirely under the ground, are rather small in size and contain a high percentage of sugar, and the other produces roots which grow larger in size, grow more out of the ground and have a content of sugar only about two-thirds as great as the roots of the other class. A number of varieties of each of these classes have been carefully tested at the Ontario Agricultural College for several years in succession. For the co-operative work over Ontario, two varieties of sugar beets for feeding purposes were distributed in 1911. The Rennie's Tankard Cream surpassed the Bruce's Giant White Feeding in 1911, while exactly the reverse was the case in 1910. A comparison of the results for the two years will show that in 1910 the Bruce's Giant White Feeding surpassed the Rennie's Tankard Cream by an average of 4.3 tons per acre while in 1911 the latter surpassed the former by about 1 1-3 tons of roots per acre. In the average of several years' experiments at the College, the Bruce's Giant White Feeding has surpassed the Rennie's Tankard Cream by about three tons per acre per annum.

Swede Turnips. As in 1910, the yields of Swede Turnips per acre were comparatively light again last season. In 1911, the Carter's Invicta occupied highest place in yield of roots per acre and in popularity with the experimenters. The Bruce's New Century and the Rennie's Empress, although both very good roots, had to take 2nd and 3rd places in yield per acre in the co-operative experiments of the past year.

Fall Turnips. But little interest is taken in Ontario in the growth of fall turnips as a farm crop. Although a few farmers applied for this experiment no satisfactory reports have been received.

Field Carrots. Field Carrots are grown in Ontario to a very limited extent. Of the two varieties distributed in the spring of 1911 the results are very similar according to the averages of the reports of the nine carefully conducted experiments which were received. The Steele-Briggs' Improved Short White surpassed the Simmers' Giant Short White by less than one-third of a ton per acre. These two lots of roots are very similar in practically all respects and both are very much superior to the old White Belgian carrot which was grown considerably in former years.

Fodder Corn. It is certainly true that no one variety of fodder corn is suitable for all parts of Ontario. The results of experiments conducted at the College with a large number of varieties of fodder corn form a general guide for farmers in different parts of Ontario. In order, however, to enable the farmers to ascertain for themselves the most suitable corns for their own particular conditions, varieties are distributed for co-operative experiments. These experiments furnish valuable information to the experimenters and to their neighbors. The average results of the co-operative experiments have only a limited value and should be studied with considerable caution. When this caution is exercised, however, the results are interesting and give a certain amount of information. In the average of the four tests conducted in 1911 the Sterling White Dent came at the top of the list in yield of fodder and in popularity. This variety seemed to be particularly suited to the dry, hot summer through which we have just passed. The White Cap Yellow Dent usually occupies a much higher position than is indicated in the results presented at this time.

Grass Peas and Vetches. Three leguminous crops which produce fodder, rich in digestible nutrients and which have a beneficial influence on the soil were distributed in the spring of 1911. Grass peas have been grown in Ontario for many years past as a grain crop and also to a certain extent for fodder purposes. The Common Vetches have been used more particularly for mixing with oats for the production of green fodder or of hay than they have for sowing as a crop by themselves. The Hairy Vetches have been recently introduced and have been used considerably as a cover crop by some of our best fruit growers. These three along with a number of other leguminous crops have been brought into competition at the College for fodder production. For the co-operative experiments, however, the test was confined to these three varieties. It will be seen that the Hairy Vetches gave the largest yield of green crop per acre in 1911, but the honors in regard to popularity are divided equally between the Hairy Vetches and the Grass peas. The Hairy Vetches occupied highest place in average yield of green crop per acre in the co-operative experiments in 1906, 1907, 1908, 1909 and 1911, second place in yield per acre in 1904 and 1910, and third place in yield per acre in 1905.

Millet. Of the three varieties of millet incorporated in the experiments throughout Ontario in 1911, the Japanese Barnyard occupied the highest place in average yield of green crop per acre. This variety, however, was not quite as popular as the Hungarian Grass or Golden Wonder. The Japanese Panicle variety which occupied the highest place in 1910 and which has given the best all round results for fodder production both at the College and throughout Ontario in past years was not distributed in 1911, owing to the fact that the available seed was rather weak in germinating power.

Rape, Kale and Field Cabbage. Some most interesting experiments have been conducted with upwards of thirty varieties of rape, kale and field cabbage at the Ontario Agricultural College. Some of the cabbages have produced average yields of fully twenty-five tons per acre for a series of years. These are greater yields than those produced from any of the varieties of corn which have been grown during the same period. It is to be regretted that no satisfactory results have been obtained this autumn from the co-operative experimenters. A few experiments were made with the Dwarf Essex Rape, Thousand Headed Kale and Sutton's Earliest Drumhead Cabbage, three of the leading varieties in their respective classes of crops.

Grasses. During the last few years Tall Oat, Orchard Grass, Tall Fescue, Western Rye, Lyme Grass and Timothy have been distributed throughout Ontario for co-operative experiments. The Tall Oat Grass has usually been a high producer of hay but the seed of this variety is expensive and rather difficult to secure in a pure condition. It is very difficult to obtain reliable results in regard to grasses which can be presented in tabulated form as they are ready for cutting at different dates and it is extremely difficult to get them cut and cured under uniform conditions.

Clovers. Co-operative experiments have for several years been conducted with Red Clover, Alsike Clover, and Mammoth Red Clover. The Mammoth Red usually produces two crops in the one year and each of the others but one crop in the season. As in the case of grasses it is very difficult to obtain data of the yields of these different crops which have been secured under uniform conditions as the crops are usually cut and harvested at different dates and are, therefore, subject to different conditions of heat, moisture, etc. We hope in time, however, to have certain information which can be presented in regard to both the clovers and grasses.

Alfalfa or Lucerne. The writer has recently been informed by some of the seedsmen of Ontario that the demand for alfalfa seed has doubled in the last two or three years. As the area devoted to the growing of alfalfa in this Province is widening from year to year it is of great importance that the farmers secure seed of the right kind. If alfalfa is being introduced into a neighborhood for the first time it is important, not only for the farmers who wish to grow this crop, but also for the farmers of the section, that a hardy strain of alfalfa be secured. If the first tests are made with tender strains which become winter killed in a short time it is not only a loss to the farmers who sowed the seed but gives a set back to alfalfa growing in the neighborhood for some time to come. That there is a marked difference in alfalfa has been made quite clear from results obtained in the United States and in Canada in recent years. Some most interesting experiments have been conducted at the Ontario Agricultural College recently and it has been found that the Variegated alfalfa which is grown to a limited extent in Lincoln, Welland and Haldimand Counties is much more hardy than the Common variety, and especially if the seed of the Common variety has been grown in a country located further south. The Common alfalfa of Utah, Colorado, Kansas, Nebraska and other Western States has proven to be decidedly more tender in Ontario than either the Grimm alfalfa of Minnesota or the Variegated alfalfa of Ontario. These two varieties of strains of alfalfa are now considered to be the two most hardy kinds of alfalfa, pure seed of which can be obtained commercially in this country. The seed of the Grimm alfalfa has been selling at a very high price. Last year it was sold at $30 per bushel.

In the spring of 1911 the writer obtained a supply of the Grimm alfalfa seed

from Excelsior, Minnesota, for use in connection with the co-operative experiments throughout Ontario. For comparison with the Grimm alfalfa, Ontario grown seed was obtained. This was secured from a field in Haldimand County which had been cropped annually since it was sown thirteen years previous. The seed which was used in sowing the field here referred to was grown on another field which had been seeded for nine years. The field last referred to has now been producing alfalfa continuously for twenty-two years since it was first seeded. It will, therefore, be seen that we have in competition throughout Ontario two very interesting lots of alfalfa, the Grimm alfalfa which is considered the hardiest strain in the United States, and the Variegated alfalfa of Ontario which has proven itself to be very hardy. These two lots of alfalfa were distributed to two hundred Ontario farmers in the spring of 1911. The reports which have been received are of very limited value, owing to the short time which has elapsed since the plots were seeded. It is interesting to note, however, that the majority of those who reported stated that the Ontario alfalfa was the most promising in the month of October at which time the last observations were made. The results of these experiments will be watched with much interest in the future.

Sweet Corn for Home Use.

Sweet corn is grown in Ontario for home use for supplying canning factories and for use as a fodder crop for farm animals. In growing corn for the canning factory, large, white ears of tender sweet corn are desirable. In growing corn for home use, however, particular attention is given to the quality of the grain and it is generally desirable to have ears comparatively small in size and containing eight rows. About fifty different varieties of sweet corn have been grown under experiment at the Ontario Agricultural College. From this list, three varieties are distributed each year to farmers throughout Ontario that they may ascertain for themselves which are the most desirable varieties for them to use for table use. The three varieties which were distributed in the spring of 1911 were the Golden Bantam, the Mammoth White Cory, and the Malakhoff. The Mammoth White Cory is a corn which is quite well known throughout Ontario and forms a good basis with which to compare the other varieties. The following table gives the average results of twenty-seven carefully conducted experiments conducted on different farms throughout Ontario during the past season:

Experiment.	Varieties.	Comparative Value.	Number of Ears.	Number of Days until ready for table use.	Table Quality.	
					Flavor.	Juiciness.
Sweet Corn (27 tests)	Golden Bantam.....	100	159	85	100	100
	Mammoth White Cory..	82	157	85	75	81
	Malakhoff	58	146	84	75	69

The results show that the Golden Bantam surpassed each of the other varieties in flavor, in juciness, and in number of ears. It was also the most popular with the experimenters. These three varieties have been distributed in each of the past four years and the results have been very similar throughout the period. The average results for the four years show that the Golden Bantam occupies 100 points,

the Mammoth White Cory 80 points, and the Malakhoff 54 points in popularity. In every year of the experiment, the Golden Bantam surpassed the other varieties both in flavor and in juiciness. The Golden Bantam variety of sweet corn produces ears, yellow in color and containing eight rows of corn, which is exceedingly tender, juicy, and of excellent flavor. This variety is becoming very popular in Ontario, and we are sure that those farmers who experiment with the sweet corn like the Golden Bantam, will no longer desire to go to the field and collect the flint or dent corns for table use, but will plant a good supply of sweet corn of the very best variety. Of the sweet corns which are at present most extensively grown in Ontario, the Stowell's Evergreen comes first, and the Mammoth Cory second in abundance. We believe, however, that the Stowell's Evergreen will be continued to a considerable extent for canning purposes and for late use on the farm, but the Golden Bantam will soon largely supplant the Mammoth White Cory and other varieties of sweet corn for early and medium use on the tables of the farm homes of Ontario.

Varieties of Potatoes.

The average annual area used for potatoes in Ontario for the last thirty years has been 157,664 acres. The number of acres devoted to this crop in 1911 was 162,457. It will, therefore, be seen that the acreage of potatoes is not increasing very rapidly in this Province. This is probably due especially to two causes; one being the scarcity of labor, and the other the fact that there are so many different varieties grown that it is almost impossible for buyers to secure quantities of potatoes of a uniform type and color for shipping to the markets. In consequence of this, the growers are compelled to rely largely upon their local markets, and the prices are consequently reduced, and uniform lots of potatoes are shipped into Ontario from outside sources. It is surely time for our farmers to take up potatoe growing in a more business-like way. The results here presented should assist in bringing this about.

In 1911, an inquiry was made of the various experimenters regarding the most extensively grown varieties of potatoes in the various counties of Ontario. In all, forty-two varieties were mentioned one or more times as being the most extensively grown in the different localities. The following gives the names and the order of the varieties which were mentioned the greatest number of times: 1, Rural New Yorker No. 2; 2, Empire State; 3, Delaware; 4, American Wonder; 5, Beauty of Hebron; 6, White Elephant; 7, Sir Walter Raleigh; 8, Irish Cobbler; 9, Early Rose; and 10, Early Ohio. Some mentioned Carman No. 1, others, Carman No. 2, and still others, Carman No. 3, and a number simply Carman, so that it was very difficult to make a determination as to the extent to which each of these Carmans was grown in comparison with other varieties. From inquiries made in each of the past five years, the Rural New Yorker No. 2 was mentioned first and the Empire State second each year as being the varieties most extensively grown throughout the Province.

In the spring of 1911, the Experimental Union distributed two varieties of late, two varieties of medium ripening, and three varieties of early potatoes for experimental purposes. Only two varieties were sent to each experimenter, and in each crop of potatoes one variety was distributed throughout and used as a basis of comparison in summarizing the results. A very large number of applications were received in the spring of the year and many valuable reports of successfully conducted experiments were obtained. The following table gives the

average results of the co-operative experiments with the varieties of potatoes conducted on about 225 Ontario farms in 1911:

Classes.	Varieties.	Comparative Value.	Per Cent. of Small Tubers.	Mealiness when Cooked.	Bushels of Whole Crop per Acre.
Late Varieties (57 tests)	Davies' Warrior.....	100	11	94	131.97
	Empire State	91	14	100	110.51
Medium Varieties (48 tests)..	Burpee's Extra Early.....	100	15	100	129.57
	Rose of the North	93	18	93	128.11
Early Varieties (118 tests)...	Extra Early Eureka.....	100	11	98	114.63
	Early Ohio.....	93	14	100	91.37
	Early Fortune.....	79	17	83	88.07

It has been the aim of the Experimental Union to distribute as few varieties of potatoes as possible, and to send out none but those which have made high records in the experiments at the Ontario Agricultural College throughout a series of years. Of those potatoes distributed in 1911, only one variety was sent out for the first time, viz., the Davies' Warrior. This potato was introduced this season owing to its very high record at the College for five years. In the five years' experiments at Guelph it has surpassed in average yield of tubers per acre all other varieties. This variety was obtained from the south-eastern part of Scotland some six years ago, and some five years after it was first introduced in Scotland. The average of fifty-seven carefully conducted experiments throughout Ontario in 1911 show that in the experiments of the two varieties distributed the Davies' Warrior surpassed the Empire State by an average of over twenty bushels per acre. The Davies' Warrior contained fewer small potatoes and was more popular with the experimenters than the Empire State variety. It was, however, not quite as mealy when cooked as the last named variety. It should be understood that the Empire State has made a very high record in the past, both at the College and throughout Ontario, as will be seen in the previous reports of the College and of the Experimental Union. We believe that in the Davies' Warrior we have, therefore, a potato of high merit, and that those experimenters who obtained this variety this year will soon increase their seed sufficiently so that it may take a leading place in the Province. Besides being a large yielding potato of good quality, it is a potato which will sell well on the market. Both varieties of potatoes, which are medium in earliness and which were distributed for co-operative experiments, gave comparatively high results this year in comparison with the late varieties. This is probably owing to the fact that the peculiar weather conditions seemed to be rather more favorable to the medium than to the late ripening varieties. Of the three early varieties of potatoes which were distributed, the Extra Early Eureka occupies highest place in average yield per acre of the one hundred and eighteen carefully conducted experiments. The Extra Early Eureka surpassed the Early Ohio in yield per acre by about twenty-three bushels, in comparative size of the potatoes and in popularity with the experimenters, and the two varieties were practically the same in table quality. In 1909 both the Extra Early Eureka and the Early Ohio were used in the co-operative experiments, and the Extra Early Eureka gave decidedly better results

than the Early Ohio in that year. In each of five years in which the Extra Early Eureka has been compared with the Early Fortune it has surpassed the last named variety in yield per acre in the co-operative experiments.

If the farmers of Ontario would confine themselves to a few of the very best varieties of potatoes, we feel confident that the average yield of potatoes in Ontario would be increased, that the average quality of the potatoes would be improved, and that the average price obtained per bushel would be greater. The results of extensive experiments with hundreds of varieties at the College and with a few of the leading varieties over Ontario in connection with the co-operative experiments, suggests the advisability of growing almost exclusively such varieties of potatoes for general cropping as the Rural New Yorker No. 2, Empire State, and Davies' Warrior—all large yielding varieties of good quality and quite saleable. For early use, either for the home or the market, the Extra Early Eureka has made a very excellent record for several years past. The average yield of potatoes in Ontario is considerably greater than that of the United States, and we believe that if the potato-growers in some of the counties of Ontario would co-operate in the development of the potato-growing industry very satisfactory results both for themselves and for others would be realized.

Fertilizers with Farm Crops.

Nineteen years ago a simple plan of co-operative experiments was started throughout Ontario. That plan has been followed up to the present day with certain extensions and improvements from time to time. It was thought at first it would be unwise to make elaborate experiments for the farmers to conduct, as experiments of this nature had been attempted from time to time, and in several cases had met with failure. In Ontario there has been a gradual development from the simple to the more complex experiments. It is now about as easy to get an experiment conducted consisting of ten plots as it was some years ago to get an experiment conducted having only half that number of plots. The lessons obtained and the information secured from the earlier experiments have been very useful in pointing the way and in giving a better foundation for future work. At some agricultural colleges a very large amount of work is devoted to the testing of commercial fertilizers on the college plots. These results furnish valuable information as a general guide, but cannot be applied with much certainty to the farms throughout the country, owing to the great diversity in the quality and the character of the land on the different farms. In Ontario it was thought wise to help the farmers study the fertility of their own farms by having them experiment with the different fertilizers along definite and well defined lines. The individual experiments furnish the experimenters and their neighbors with information which it is impossible for them to obtain in any other way. Besides this, the average results of all the separate experiments, when continued over a series of years, give some interesting information for the country as a whole. We believe, therefore, that we have and will continue to obtain valuable information, not only for the farmers themselves who conduct the experiments, but also as a general guide in showing what the various fertilizers will accomplish on the different crops and on the different soils of the Province.

For the co-operative experiments, the fertilizers and the seeds have been sent from the College to experimenters each year. In every instance the nitrate of soda and the muriate of potash have been applied at the rate of 160 pounds per acre and the superphosphate at the rate of 320 pounds per acre. A mixture or

complete fertilizer has been composed of one-third the amount of these fertilizers, making in all 213 1-3 pounds. Both the Royal Canadian and the potato fertilizer used in each of the past five years with the potato crop were applied at the rate of 320 pounds each per acre. The nitrate of soda has been applied when the plants were about three inches in height, and all the other fertilizers at the time of sowing the seed. Farmyard manure has been used in the experiments of the past nine years. The advice to each experimenter has been to apply 500 pounds of average cow manure per plot, the application being equal to twenty tons per acre. The cow manure has been mixed with the soil to a depth of from four to five inches, and the fertilizers have been stirred in the soil to a depth of from one to two inches.

The foregoing description applies to all the co-operative experiments with fertilizers conducted previous to 1910, also those conducted in the past two years with winter wheat and potatoes. Another experiment with fertilizers and barley was started in the spring of 1910 which will be described more fully in another part of this report. The table here presented gives the average results of the co-operative experiments with fertilizers on different kinds of farm crops for a period varying from five to eight years:

Kind of Fertilizer used.	Average yield per acre.								
	Fertilizer per acre.		Oats.	Winter Wheat.	Fodder Corn.		Mangels.	Swede Turnips.	Potatoes.
					Total.	Ears.			
	Exact Weight.	Approximate Cost.	5 yrs. 74 tests.	7 yrs. 21 tests.	8 yrs. 47 tests.	8 yrs. 41 tests.	5 yrs. 41 tests.	5 yrs. 18 tests.	5 yrs. 98 tests.
	Lbs.	$ c.	Bus.	Bus.	Tons.	Tons.	Tons.	Tons.	Bus.
Nothing	.....	.....	38.9	19.6	8.2	2.7	20.6	19.6	129.2
Nitrate of Soda	160	4.80	46.3	23.5	9.4	3.1	26.5	22.5	153.4
Muriate of Potash	160	4.00	43.8	22.8	9.4	3.0	24.6	23.7	160.8
Superphosphate	320	3.92	43.6	22.7	9.0	3.1	24.2	24.7	156.8
Complete Fertilizer	213	4.24	48.7	24.4	9.4	3.2	25.4	25.0	166.8
Potato Fertilizer	320	5.52	.....	.....	.....	.....	.....	.....	167.5
Royal Canadian	320	5.60	.....	.....	.....	.....	.....	.....	164.5
Cow Manure	40,000	6.00	.....	26.6	.....	.....	.....	26.9	174.7

The average results of the co-operative experiments with fertilizers on winter wheat and potatoes for 1911 are included in the summary here presented. The cost of each fertilizer, as given in the table, represents very closely the average cost per acre for the fertilizers as used in the co-operative experiments. The quotations were based on the prices for quantities of about one ton of each fertilizer. The twenty tons of cow manure would mean about twelve good sized loads per acre, and manure in Guelph has been selling at fifty cents per load, which is probably about the average for the Province. It is exceedingly difficult to place a price on farmyard manure, as, in most cases, it is not purchased but is produced on the farm. Each person may place such value on the manure as he deems expedient and study the results according to his own circumstances. It should be stated that the freight on the fertilizers and the application of both the fertilizers and the manure are not taken into consideration in the foregoing statement, nor yet is there any account made of the influence of the different fertilizers and the manure on the land after the first season.

Fertilizers with Oats. Seventy-four good reports of successfully conducted experiments in applying fertilizers to oats were received during the five years in which this experiment was conducted over Ontario. The lowest average yield was obtained from the unfertilized land, 38.9 bushels per acre; and the highest average yields from the mixed fertilizer, 48.7 bushels; and the nitrate of soda, 46.3 bushels per acre. The unfertilized land produced the lowest yield per acre in each of the five years. The mixed or complete fertilizer gave the largest yield of oats per acre in the average results of this experiment in each of the five years in which it was conducted. Although the land which received the mixed fertilizer gave an average of 9.8 bushels of oats per acre more than the unfertilized land, still this increase was produced at a cost of about 42 cents per bushel, according to the present prices of fertilizers. It will, therefore, be seen that it is only in special years that these commercial fertilizers will give economical results with oats on the average land of Ontario. The mixed fertilizer gave a larger average yield than no fertilizer on heavy soils by 12.7 bushels per acre, on light soil by 10.2 bushels per acre, and on black mucky soils by 7.1 bushels per acre.

Fertilizers with Winter Wheat. In the co-operative experiments of different fertilizers applied to winter wheat, it will be seen that the greatest average yield per acre was produced from the application of cow manure. The complete fertilizer, when applied at the rate of 213 pounds per acre, gave a little more than two bushels per acre below the cow manure. It will be observed that the land which received the complete fertilizer gave 4.8 bushels per acre more than that which received no fertilizer. According to the prices of the fertilizers given in the table, the most economical increase in yield of winter wheat was made by the application of the mixed fertilizer, and even in this case the cost of the increased yield amounted to 88 cents per bushel.

In 1911, the unfertilized land gave an average of 16.8 bushels of winter wheat per acre, the land which received farmyard manure 23.9 bushels, and the mixed fertilizer 21.2 bushels per acre. It will, therefore, be seen that the result from the cow manure and that from the complete fertilizer was a little more marked in 1911 than in the average of the past seven years.

Fertilizers with Corn. In the average of experiments in applying fertilizers with corn in each of eight years, during which time forty-seven complete and satisfactory reports were received, it will be seen that the yields of whole crop produced by the plots which received an application of nitrate of soda, muriate of potash, and mixed fertilizer, were equal, while a plot on which superphosphate was applied produced nearly half a ton less than the others, and that the largest yield of husked ears was obtained when the mixed fertilizer was applied to the land. The muriate of potash produced the corn at the least cost per ton, but even with this fertilizer it cost $3.33 on the average to produce each additional ton of fodder corn.

Fertilizers with Mangels. During the five years in which fertilizers were used with mangels, forty-one good reports of successfully conducted experiments were received. These show that the smallest average yield was produced from the unfertilized plot, viz., 20.6 tons per acre, and that the largest average yield was produced from the nitrate of soda, viz., 26.5 tons per acre. As in the case with corn, the unfertilized land gave the lowest yield in each year. The nitrate of soda produced the highest yield in four out of five years. The average of 197 bushels of mangels per acre, produced by the nitrate of soda over the unfertilized land, was obtained at a cost of about 2.4 cents per bushel. The nitrate of soda

produced the largest yield on both heavy and light soils, but on the black loams the muriate of potash gave the highest yields of mangels. The nitrate of soda showed the greatest influence upon the light soils, as in the average of fifteen experiments the sandy land which was fertilized at the rate of 160 pounds of nitrate of soda per acre gave an average yield of 7 2-3 tons per acre more than the land which was unfertilized.

Fertilizers with Swede Turnips. From the average results of the five years' experiments with fertilizers and Swede turnips, it will be seen that farmyard manure has given the largest, the complete fertilizer the second largest, and the superphosphate the third largest yield of roots per acre. According to the prices given for the manure and the fertilizers in the foregoing table, the increased yield of turnips was produced at a cost of 82 cents per ton by the use of cow manure, and 78.5 cents per ton, or 2.4 cents per bushel, by the use of the complete fertilizer.

Fertilizers with Potatoes. For five years in succession, an experiment was conducted at the Ontario Agricultural College in testing thirteen different kinds of fertilizers with potatoes. In that experiment, the average results showed that the Royal Canadian fertilizer gave the highest, and the Potato fertilizer the second highest yield of tubers per acre. Based on the results of this experiment, another was arranged, and it was also conducted for five years in succession. The results of this series of tests showed that the highest average yield of potatoes was obtained from the use of a mixed fertilizer similar to the one used in connection with our co-operative work with other crops. This, however, was closely followed in yield by the Royal Canadian and by the Potato fertilizer. The last two are both complete fertilizers, each containing nitrogen, phosphoric acid, and potash. The Royal Canadian fertilizer is sold by the Capelton Chemical Co., Buckingham, Quebec, and the Potato fertilizer by the W. A. Freeman Co., Hamilton, Ont.

Based on the experiment conducted at the College, a co-operative experiment was arranged for testing different fertilizers with potatoes throughout Ontario. This experiment has now been carried on for five years in succession. In each of the past five years, both potatoes and fertilizers were distributed from the College to applicants throughout Ontario. From these experiments, reports of successfully conducted tests were received from twenty-two experimenters in 1907, sixteen in 1908, twenty-six in 1909, twenty-one in 1910, and thirteen in 1911, making a total of ninety-eight distinct experiments conducted with fertilizers and potatoes within the past five years. The average results for the five years' tests are presented in tabulated form along with the results of the fertilizers with the other kinds of farm crops.

It might be here stated that the comparative results of the different fertilizers were quite similar in each of the past five years. Although the yields per acre were lower than usual in 1911, the comparative order in yield per acre produced by the different fertilizers was very similar to that of the other years. It will be seen from the summary table of the fertilizers that the three complete manures gave the highest results. As the cost of the home-mixed complete fertilizer, however, was considerably less than that of the Potato fertilizer and the Royal Canadian, the results from this fertilizer would be the most economical. The highest yield of all in each of the past five years was produced by the application of cow manure at the rate of twenty tons per acre. The land thus treated gave an average of 45.5 bushels more than the land which was unfertilized.

According to the prices given for the manure and the fertilizers in the foregoing table, the increased yield of potatoes was produced at a cost per bushel for the complete fertilizer of 11.3 cents; muriate of potash, 12.7 cents.; cow manure, 13.2 cents; superphosphate, 14.2 cents; potato fertilizer, 14.4 cents; Royal Canadian fertilizer, 15.9 cents; and nitrate of soda, 19.8 cents.

In each of the past five years, experimenters were asked to test the table quality of the potatoes including both flavor and mealiness. Although about 80 per cent. of the experimenters evidently tested the potatoes as instructed, they were unable to observe sufficient difference in the quality to permit them to make the comparative report. According to the reports of the co-operative experiments with fertilizers and potatoes for 1911, there appears to have been practically no rot and but little scab amongst the potatoes throughout.

Fertilizers with Barley. In 1910 arrangements were made for conducting an experiment with fertilizers and barley throughout Ontario. The experiment consisted of ten plots, seven of which received commercial fertilizers, one lime, one cow manure, and one was left unfertilized. For the seven plots which received commercial fertilizers, nitrate of soda, superphosphate and muriate of potash were used singly and in combinations of two and three together. The number of pounds per acre of each fertilizer used was 100 for both the nitrate of soda and the muriate of potash and 200 for the superphosphate, whether these were sown separately or in combination. The freshly slaked lime was used at the rate of 1,400 pounds per acre and the cow manure at the rate of twenty tons per acre, As in the case of the other fertilizer experiments, the nitrate of soda in every instance was applied when the plants were about three inches in height and all the others were applied at the time of seeding. All the other applications for the fertilizer experiment with barley were the same as those for the fertilizer experiments previously reported. The experiment in 1911 was similar to that in 1910, with the exception that hydrated instead of freshly slaked lime was used. The average of the six reports of successfully conducted experiments in 1911 and of the eleven reports of the experiments conducted during the past two years are here presented:

	Individual Fertilizer per acre.	Total Fertilizer per acre.		Yield per acre.			
				Straw (tons)		Grain (Bus.)	
	Pounds.	Pounds.	Cost. $	1911.	Average 2 yrs.	1911.	Average 2 yrs.
1. Nothing				1.16	1.08	24.38	25.28
2. Nitrate of Soda	100	100	3.00	1.37	1.18	29.30	29.19
3. Muriate of Potash	100	100	2.50	1.40	1.29	29.17	29.71
4. Superphosphate	200	200	2.45	1.45	1.31	31.67	30.67
5. Nitrate of Soda	100	200	5.50	1.33	1.24	31.05	32.19
Muriate of Potash	100						
6. Nitrate of Soda	100	300	5.45	1.33	1.27	30.48	31.62
Superphosphate	200						
7. Muriate of Potash	100	300	4.95	1.48	1.33	32.37	32.69
Superphosphate	200						
8. Nitrate of Soda	100	400	7.95	1.38	1.33	31.67	33.80
Muriate of Potash	100						
Superphosphate	200						
9. Lime	1,400	1,400	4.60	1.12	1.19	23.27	26.97
10. Cow Manure	40,000	40,000	6.00	1.54	1.43	32.22	34.28

The average results here presented show that the fertilizers and manure surpassed the unfertilized land in yield of barley per acre from 3.9 to 9 bushels per acre. In 1910, 1,400 pounds of slaked lime per acre increased the crop from 26.17 bushels to 30.6 bushels per acre. In 1911, however, the results for the hydrated lime were rather peculiar. In three experiments the land which received the hydrated lime gave a slight increase over that which was left unfertilized; in two instances the results were exactly the same; and in one experiment the hydrated lime plot gave very low results. The general results from the different applications were quite similar in the two years. According to the increases in the yield of Barley per acre and the prices of the fertilizers given in the table, it appears that the most economical results were obtained by the application of 200 pounds of superphosphate per acre, as this application increased the yield of barley 5.39 bushels at a cost of $2.45. The increase in barley in this case, therefore, was secured at a cost of 45½ cents per bushel for the fertilizer applied. Although the complete fertilizer gave over three bushels per acre more than the superphosphate, the cost of the fertilizer was so much greater that it brings the average price of each increased bushel of barley considerably higher.

In 1910 one experiment with fertilizers and barley was conducted on a clay loam with a clay subsoil and which was an Alsike Clover sod. The influence from the fertilizers was very slight, while in the case of another fertilizer experiment on a clay loam which had not received manure for many years the fertilizers showed a very marked influence, as for instance, the complete fertilizer gave nearly double, and the cow manure nearly three times the amount as compared with the crop produced on the unfertilized land. In 1911 in one experiment which was conducted on a sandy loam which was manured in the spring of 1909 and produced potatoes in that year and carrots in 1910, the results of the fertilizers were very marked. The application of the muriate of potash and superphosphate exactly doubled the yield per acre over the unfertilized land. These experiments with fertilizers are furnishing some most excellent information, not only to the farmers who are conducting the experiments but also for their neighbors who can see the experiments and understand the conditions through which they are carried out.

Applications of Nitrate of Soda and Common Salt with Mangels.

Co-operative experiments were conducted throughout Ontario for five years in succession in testing different fertilizers with mangels. It was found that an application of 160 pounds of nitrate of soda per acre applied to the land when the mangels were about three inches in height increased the yield of roots per acre about six tons, according to the average results of the forty-one separate tests conducted within a period of five years. In the spring of 1911 another experiment was started with fertilizers and mangels. For this experiment, nitrate of soda was applied to mangels at the rate of 100, 160 and 200 pounds per acre at the time of sowing the seed and also on separate plots when the mangel plants were about three inches in height. In comparison with these six plots with nitrate of soda, common salt was applied at the rate of 200 and 400 pounds per acre at the time of sowing the mangel seed. Owing to the very unfavorable conditions for the mangel crop in 1911, there has not been a sufficient number of reports of this experiment received to present at the present time. The results received seemed to indicate the economy of using 100 pounds of nitrate of soda for the mangel crop. This experiment will likely be repeated both at the College and throughout Ontario for several years.

Q.—How does the O. A. C. No. 72 compare with the Banner?

Prof. Zavitz: During the last five years, it has surpassed the Banner in yield of both grain and straw per acre, in strength of straw, and in quality of grain in the experiments at the College.

Q.—How does the percentage of hull compare with the Banner?

Prof Zavitz: The average percentage of the hull of the Banner has been 29.5 and that of the O. A. C. No. 72 only 27.5. The percentage of hull is also less than that of the Siberian, the Lincoln, the Sensation, the Abundance, etc.

Q.—The Siberian is a good oat to yield, but don't you think it is a little weak in the straw?

Prof. Zavitz: The Banner may have a slight advantage over the Siberian in strength of straw. The O. A .C. No. 72 is slightly stronger in the straw than either the Siberian or the Banner.

Q.—How many bushels to the acre does the O. A. C. No. 72 yield?

Prof. Zavitz: Its yield over Ontario this year was 39.8, and at the College 44. Of course, this season, as you know, was exceptionally dry and hot. The average yield per acre of the O. A. C. No. 72 at the College for the past five years has been 80 bushels per annum.

Q.—What is the difference in the value of feed in emmer and barley?

Prof. Zavitz: There is very little difference in the feeding value of emmer and of barley, according to the feeding experiments which have been conducted in the United States.

Q.—Are they the same weight per bushel?

Prof. Zavitz: The standard weight per measured bushel of the barley is 48 pounds and of emmer 40 pounds. In referring to the yields per acre of these two grains in this report, we speak of pounds instead of bushels per acre. According to the average of the reports of the Bureau of Industries for Ontario for the past thirty years, we get an average of 120 pounds of grain per acre more from barley than we do from oats. Many farmers of Ontario are greatly deceived in regard to the comparative yields of oats and barley. On the average, barley yields more pounds of grain per acre, has less hull, and has more digestible nutrients per pound than oats.

Q.—Did you ever grow spring rye for green feed for cattle ?

Prof. Zavitz: No, it is not very satisfactory for green feed for cattle. The winter rye produces more heavily than the spring rye and is better for using as a green fodder.

Q.—Do you advise using spring rye in mixed grain?

Prof. Zavitz: You might use it in some cases. It does not mature very satisfactorily with the other grains.

Q.—About when would you sow buckwheat?

Prof. Zavitz: We usually sow it the latter part of May or early in June. You can sow buckwheat at quite a variety of dates in the summer. This is quite different from spring wheat, barley or oats which should be sown as early in the spring as the land can be worked to good advantage.

Q.—Is buckwheat hard on the soil?

Prof. Zavitz: One hundred pounds of buckwheat do not take as much fertility from the soil as one hundred pounds of wheat, oats, barley, rye or corn.

Q.—What is the yield per acre?

Prof. Zavitz: The average yield per acre of the rye buckwheat at the College for six years has been about 33 bushels. The yield in 1911, however, was comparatively low, owing to the severe weather conditions. The yield in the co-

operative experiments throughout Ontario was only 15.3 bushels per acre in the past year.

Q.—How much soy bean meal would you use for feeding to cows?

PROF. ZAVITZ: The soy bean meal should be used about the same as cotton seed meal for improving the meal rations for farm stock.

Q.—In what proportion do you sow mixed grains, such as oats and barley?

PROF. ZAVITZ: We have tested different proportions here at the College. For five years, we used nine different proportions. I need not explain these tests in detail but simply state that the results of the experiments, both here and throughout Ontario, have been in favor of a mixture of one bushel (34 pounds) of oats, and one bushel (48 pounds) of barley.

Q.—Which was next best in yield, the increased amount or the decreased amount of seed?

PROF. ZAVITZ: In 1910, from a mixture of half a bushel of each, we secured 1,528 pounds of grain; from the bushel of each, 2,104 pounds; and from the one and one-half bushels of each 2,096 pounds. In 1911, from the half bushel of each 1,420 pounds; from the bushel of each 1,820 pounds; and from the bushel and a half of each 1,594 pounds. It will therefore be seen that the heaviest seeding gave a heavier yield than the lightest seeding in each of the two years of the co-operative experiments.

Q.—Do you advise using peas in the mixture of oats and barley for grain?

PROF. ZAVITZ: We find that peas will do admirably in a mixture for the production of green fodder or of hay, but for grain production, especially with oats and barley, the peas when used in the mixture do not fill well. Whenever peas are put in the mixture there is a reduction in the yield per acre. So far, we have not been able to find anything which we could mix with oats and barley to increase the yield per acre. In a test where we used from 8 to 12 different crops all mixed together, we found that in practically every test made within the last ten years barley came at the top of the list in the production, and oats usually came second, and rye followed these fairly closely. Rye is likely to do the least harm of any of the grains to mix with oats and barley.

Q.—What about emmer?

PROF. ZAVITZ: As a rule, emmer will give a very large yield by itself, but will not hold its own in the mixture.

Q.—What is the result of re-sowing the mixture of barley and oats?

PROF. ZAVITZ: We find we get the best results by using mixtures in definite proportions. When the mixture is grown, the proportion of each is changed and the results of sowing the crop obtained from the mixture is not as likely to give as good satisfaction on this account. For the very best results, it is wise to have the mixture made of the right quantity of each kind of grain.

Q.—How do you find the mixed crop stands up?

PROF ZAVITZ: The mixture that I have mentioned—that is, when the right varieties and the right proportions are used—generally stands up well and ripens uniformly. For green fodder, when we use the Banner or the Siberian oats, and the Golden Vine or the Prussian Blue peas, ninety-six per cent. of the crop was standing when we were ready to harvest it, according to the average results at the College for a period of five years. If the amount of peas is increased, the crop is apt to go down, or if you use other varieties of peas, the results are often less satisfactory. What is wanted is a variety of peas with a long slender vine, but which will give you a large yield, with upright growth. .

Q.—What state of maturity would you recommend it to be cut so as to be good for fodder?

PROF. ZAVITZ: When the oats are in the late milk condition, and the peas about half grown.

Q.—How would you advise sowing that mixture?

PROF. ZAVITZ: There is no rule in regard to it. You can soon find out how it is running out of the drill. Perhaps you can adjust that with your drill before you go out. Both drills and grains differ, but as a rule, a farmer knows his own drill fairly well and can soon adjust it so as to give the desired results.

Q.—Would you consider the Golden Bantam corn a good variety for Northern Ontario?

PROF. ZAVITZ: I would consider it to be an excellent variety for Northern Ontario, because it is an early corn of excellent quality.

Q.—Don't you think some of the potatoes have half a dozen different names?

PROF. ZAVITZ: There are a great many different varieties, and not so many duplications as we sometimes think. It is quite true that in some cases the same potatoes are grown under different names. We have tested over 300 varieties of potatoes at the College, and we have examined the potatoes very carefully. We found a comparatively few real duplicates. There are, however, far too many varieties of potatoes grown in Ontario. I believe if we would confine our attention to three or four of the best varieties for growing in Ontario we would get larger yields per acre from the same land on the individual farms and from the province as a whole, and get potatoes of better quality and which would sell for better prices.

Q.—How can we do it?

PROF. ZAVITZ: We have got to come together on a common basis. We should give particular attention to the results of definite, carefully conducted and long continued experiments in our own country rather than to the remarks of agents or the results of tests made outside of Ontario. I will submit to you the results of our experiments at the College and of the co-operative experiments throughout Ontario. There is one variety of potatoes that we have been sending out for years as a general cropper in connection with co-operative experiments, and that is the Empire State. That variety has been distributed for several years, and it has made an excellent record over Ontario as a high yielder of marketable potatoes, which are of good table quality and which sell readily on the market. It is grown quite extensively throughout Ontario at the present time. The Rural New Yorker stands first, and the Empire State stands second, in regard to acreages, as indicated by the numerous replies received from our inquiries of the past three or four years.

Q.—Isn't the Empire State pretty late in reaching maturity?

PROF. ZAVITZ: Yes, it is a variety for the general crop. There are only three general crop varieties of potatoes I intend to mention: the Empire State, the Rural New Yorker No. 2, and the Davies' Warrior.

Q.—Are these all late potatoes?

PROF. ZAVITZ: Yes, these are all late varieties and are grown for the general crop and not for early use.

Q.—How do the Empire State and the Rural New Yorker No. 2 compare when grown together?

PROF. ZAVITZ: If the Rural New Yorker No. 2 and the Empire State are grown together on rich land, the Rural New Yorker No. 2 is rather coarse in the grain and the Empire State is of finer quality. The Empire State has given us

a little higher record than the Rural New Yorker No. 2 in yield per acre at the College.

Q.—What about the Delaware?

PROF. ZAVITZ: The Delaware has given a lower yield per acre than the Empire State, the Rural New Yorker No. 2, or the Davies' Warrior.

Q.—How does the Carman yield?

PROF. ZAVITZ: We have the Carman No. 1 and the Carman No. 3, and some say the Carman No. 2. In the average of the last five years, the Empire State has surpassed the Carman No. 1 in yield per acre per annum by fifty-one bushels in the experiments at the College.

Q.—What three varieties are grown in Nova Scotia and New Brunswick?

PROF. ZAVITZ: The Delaware is grown considerably in New Brunswick and the Empire State and the Green Mountain varieties are grown in certain places.

REPORT OF COMMITTEE ON CO-OPERATIVE EXPERIMENTS WITH FERTILIZERS ON FRUITS AND VEGETABLES.

PROF. R. HARCOURT, O. A. C. GUELPH.

This is a new committee and its first report; consequently our report consists more of what we have undertaken, rather than of results obtained. Realizing that to secure reliable, trustworthy results, the experiments must be continued for some years, we have endeavored to place the experiments on Government farms or with men who were interested and under the supervision of the Agricultural District Representative of the county. At the same time, we may point out that it is doubtful if we can secure as good results this way as if the experiments were under our own control. In saying this we do not mean to belittle the work done by the experimenters; on the contrary, we appreciate very much their interest and co-operation; but, in the rush of other work it may not always be convenient to treat all the plots of the experiment exactly alike in cultivation, pruning, spraying, etc., and, furthermore, the extra expense incurred in keeping track of the fruit from the several plots which, for example with peaches, may have to be picked four or five times to get the fruit off in the best condition, is more than most men are willing to undertake.

However, your committee found a number of men willing to undertake the work. We then visited the orchards, planned the plots so as to have uniform soil throughout and an even stand of trees, and arranged for the application of the fertilizers.

Only two of the orchard fruits were included in the experiments this year, peaches and apples. The experimenters with peach trees are: W. C. McCalla, St. Catharines; A. D. Harkness, Horticultural Experiment Station, Jordan Harbor; and J. B. Fairbairn, Vineland. Each experiment consists of five plots of exactly the same size and containing the same number of trees, but the plots of one experimenter are not necessarily of the same size as those of another. In two of the three experiments each of the five plots is one-quarter of an acre in size, making one and a quarter acres in the experiment. The trees were all young and just coming into bearing. The plan of the experiment is as follows:—

Plot No. I.—Check.

" II.—Sodium Nitrate .....160 lbs. per acre
Muriate of Potash.....200 " "
{ Superphosphate .....200 " "
{ Bone Meal .....200 " "

" III.—Sodium Nitrate.....160 " "
Muriate of Potash.....200 " "

" IV.—Sodium Nitrate.....160 " "
{ Superphosphate .....200 " "
{ Bone Meal .....200 " "

" V.—Muriate of Potash .....200 " "
{ Superphosphate.....200 " "
{ Bone Meal .....200 " "

The trees were not in full bearing this year and no effort was made to secure yield of crop.

The experimenters with fertilizers in the apple orchard are: Jas. E. Johnson, Simcoe; Jos. Gilbertson, Simcoe; A. G. Maybee, Port Hope, and W. H. Gibson, Newcastle. The plan of these experiments is exactly the same as with the peach orchard. It is quite possible that with good cultivation and free use of the legumes as cover crops, no nitrogenous manure is necessary, but it has been included in three of the experiments to note the effect.

The trees in the Norfolk County orchards are Spys in full bearing. The soil is a comparatively light sand and both orchards are receiving thorough cultivation and spraying. Mr. Gilbertson's orchard has received rather heavy applications of farmyard manure for some years and the trees are making strong growth of wood with rather poor colored fruit. Believing that the nitrogenous manure will do harm rather than good in this orchard, it has been left out. It will be interesting to note whether the potassic and phosphatic fertilizers will improve the color of the fruit.

The two Durham county orchards are on clay loam. One is planted with Ben Davis, just beginning to bear. The other orchard contains four varieties and the fertilizer plots have been arranged to cross the rows of these varieties, consequenty the same number of trees of each variety will appear in each plot. The plan of this experiment is as follows:—

Plot No. I.—Check.

" II.—Sodium Nitrate.....160 lbs. per acre.
Muriate of Potash .....200 " "
{ Superphosphate.....200 " "
{ Bone Meal.....200 " "

" III.—Sodium Nitrate.....160 " "
Muriate of Potash .....200 " "

" IV.—Sodium Nitrate.....160 " "
{ Superphosphate.....200 " "
{ Bone Meal.....200 " "

" V.—Muriate of Potash.....200 " "
{ Superphosphate .....200 " "
{ Bone Meal.....200 " "

Your committee were fortunately able to arrange with Prof. E. J. Zavitz, Director of the Ontario Forestry Farm, St. Williams, Norfolk County, to have an experiment conducted on the light sand lands of that farm. A field of about

seven acres of uniform land was selected for the purpose and part of it was planted at once, but owing to the fact that the experiment was not undertaken until the planting time it was impossible to secure all the trees required. The varieties to be used are the Spy, Baldwin, Wealthy and Duchess.

The land was divided into two equal portions and each part will be planted exactly alike. On one of these sections legumes will be used as a cover crop, and in the other cereals. The fertilizer plots cross both these sections and the experiment is thus exactly duplicated in all respects but the cover crop. Each of the fertilizer plots is one and one-tenth of an acre in size. The materials used are arranged as follows:

Plot No. I.—Farmyard Manure.

" II.—Nitrate of Soda .....200 lbs. per acre.
Muriate of Potash .....200 " "
Superphosphates .....200 " "
Bone Meal .....200 " "

" III.—Nitrate of Soda.....200 " "
Muriate of Potash .....200 " "

" IV.—Nitrate of Soda.....200 " "
Superphosphates.....200 " "
Bone Meal.....200 " "

" V.—Muriate of Potash .....200 " "
Superphosphates .....200 " "
Bone Meal.....200 " "

" VI.—Check.

It will necessarily be some time before we can get any record of yields from this orchard, but, in the meantime, there may be some interesting observations on the effect of the various materials used in the growth of the trees.

Vegetables. Our only experiment in vegetables is with the College kitchen garden, which is about six acres in extent. All the vegetables are grown in rows running one way, and we have crossed this with a nine-plot experiment arranged as follows:

Plot No. I.—Nitrate of Soda.....200 lbs. per acre
Muriate of Potash.....200 " "

" II.—Nitrate of Soda.....200 " "
Superphosphate .....500 " "

" III.—Muriate of Potash .....200 " "
Superphosphate .....500 " "

" IV.—Check.

" V.—Nitrate of Soda .....200 " "
Muriate of Potash .....200 " "
Superphosphate .....500 " "

" VI.—Calcium Cyanamide.....200 " "
Muriate of Potash .....200 " "
Superphosphate .....500 " "

" VII.—Nitrate of Soda.....200 " "
Muriate of Potash .....200 " "
Bone Meal .....400 " "

" VIII.—Nitrate of Soda.....200 " "
Muriate of Potash .....200 " "
Basic Slag .....400 " "

" IX.—Nitrate of Soda.....200 " "
Ground Feldspar .....500 " "
Superphosphate .....500 " "

The garden will be manured with stable manure as usual, and the cultivation will be uniform across all the plots. To determine the yields on these nine plots with all the vegetables grown in the garden will manifestly be impossible without very largely increasing the work of harvesting, but we hope to secure some data even if the yields are not determined.

In conclusion, we wish gratefully to acknowledge the hearty co-operation of the experimenters and Messrs. R. S. Duncan and J. E. Smith, the Agricultural District Representatives, who have assisted us materially in many ways. We wish also to thank Mr. Emslie, of the German Potash Syndicate, and Dr. W. S. Myers, of the Chilian Nitrate Propaganda, for most of the fertilizers used in these experiments.

Q.—What special fertilizers did you find really best?

Prof. Harcourt: We have not carried on these experiments long enough to answer the question definitely. Our experiments here referred to were only started this year. I may say, though, in general, that before a farmer can use fertilizers intelligently and economically he must know: (1) something about the fertilizers themselves, what they supply, and the condition of the plant food constituents in them; (2) something about the needs of the particular crops which he is growing; and (3) the deficiencies of the soil. The first he can only learn by studying the question of plant food and fertilizers; the second by making himself familiar with plant requirements; and the third by carrying out some such experiments as I have outlined in the above. I think that when such an experiment is intelligently conducted that the farmer will become familiar with the materials supplied in our fertilizers, and thus know what to expect when he buys these materials, and as a result appreciate more what is given in the guarantee of mixed fertilizers. I think there is no doubt that artificial fertilizers can be used with profit on many crops, particularly those on which a large amount of labor is expended, but I would strongly advocate the advisability of using these in a small way at first so as to demonstrate whether they can be used with profit or not.

Q.—What advantage would there be in wood ashes to clay soil?

Prof. Harcourt: Clay soils are generally fairly rich in potash. Wood ashes also contain potash and some phosphoric acid. In addition, they contain a considerable quantity of calcium carbonate, consequently wood ashes would supply a good form of potash, but some phosphoric acid and the carbonate of lime would increase the availability of the potash of the clay itself. Wood ashes may be applied to land which is to be sown with legumes with good results. Many of our fruits also consume considerable quantities of potash, and here again ashes would be of value. A further point in connection with the use of wood ashes is that the lime which they contain would tend to improve the physical condition of the clays.

Q.—How did you find the muck soils as to fertility?

Prof. Harcourt: Most of our muck soils are excessively rich in nitrogen, but contain comparatively small amounts of potash and phosphoric acid. Most of the soils of this nature that we have examined have contained quite large quantities of lime, so that in only a very few cases have we found sour muck soils. Much of the nitrogen that these soils contain is not in an available condition and it has been frequently demonstrated that small applications of farmyard manure have much increased the availability of the nitrogen. Presumably this was due to the introduction of organisms which would cause the rapid decay

of the organic matter. As a class, these soils require the addition of some potash and phosphatic manures to get the best results from them.

Q.—How would you advise putting wood ashes on soil?

PROF. HARCOURT: The simplest way is to apply by hand broadcast. They should never be mixed with farmyard manure.

Q.—Do muck soils as a rule require nitrogen?

PROF. HARCOURT: As previously explained, muck soils are rich in nitrogen and frequently contain as much as five to ten times the quantity found in our ordinary arable soil. This nitrogen is in organic combination and can only be brought into an available form as the organic matter is decomposed. This decomposition can be brought about by drainage, cultivation, and, as previously stated, in some cases the introduction of organisms which bring about this decay is required.

CONCLUSIONS FROM SEVEN YEARS' CO-OPERATIVE EXPERIMENTS IN THE USE OF LEGUME BACTERIA WITH ALFALFA, CLOVER, PEAS, ETC.

PROF. S. F. EDWARDS, O.A.C., GUELPH.

The work of distribution of artificial cultures of nitrogen-accumulating bacteria for inoculating seed was started by Dr. Harrison, now of Macdonald College, and Mr. B. Barlow, in 1905. The method of preparing the cultures as devised by Mr. Barlow, and which has been used ever since with some slight modifications, consists in isolating the appropriate bacteria from the "tubercles" on the roots of the different legumes, growing them on artificially prepared culture material in glass bottles, and distributing to the farmer in such condition that he has only to mix the culture with the seed to be treated and sow it in the usual way.

During the early autumn blank reports are sent out to recipients of the cultures asking them to state the results of the experiment. These reports are carefully reviewed and those are discarded in which no uninoculated seed was sown, or where any other condition militated against fair judgment as to the success of the experiment.

The tabulated results of this work for the seven years since its inception are as follows:—

SUMMARY OF RESULTS IN SEED INOCULATION, 1905-1911.

Year.	Total Cultures sent.	Total Reports received.	Inoculation beneficial.	Inoculation not beneficial.	*Others.	Per Cent. favorable.
1905	246	134	91	40	3	67.9
1906	375	144	72	48	24	60.0
1907	372	187	67	57	63	54.0
1908	2,113	699	397	237	65	62.5
1909	2,017	494	211	161	122	56.7
1910	3,375	771	344	179	248	65.7
1911	4,941	1,307	453	371	483	55.0

* In this column are included reports from farmers who sowed no uninoculated seed, or in which long continued drouth, excessive moisture, or some other condition injured or destroyed the seeding.

During the last three years the demand for cultures has been mostly for inoculation of alfalfa and red clover. Of the 4,941 cultures sent out last season, 3,944 or 79.8 per cent. were for alfalfa, and 756 or 15.3 per cent. were for red clover, leaving only 4.9 per cent. of the total number to cover alsike clover, white clover, peas, beans, vetches, sweet peas, and lathyrus, the other cultures sent out. For alfalfa and red clover the percentage of favorable results from the inoculation was 50.4 for alfalfa and 56.6 for red clover. In view of this percentage, we feel that the work is well worth while and are planning for its continuation.

Q.—How long before planting are you to apply this culture?

Prof. Edwards: Usually half an hour is enough. The cultures are sent out in one and one-half ounce bottles, and it is simply a matter of taking a little skimmed milk or whey and rinsing the culture out of the bottle and then mixing that suspension with the seed and spreading it out to dry.

Q.—What would one do in case a person doesn't get the bushel sown in the same day?

Prof. Edwards: The bacteria are very readily killed on drying. We find in our laboratory experimentals that about 95 to 96 per cent. of the bacteria are killed in the actual drying, and there is where the difficulty would come in in treating all the seed and allowing some of it to stand over more than a few hours. If it can be sown in the first day, I would say that the bacteria would probably remain alive, because there would be a little moisture left there for a number of hours.

Q.—What plan do you take for drying the seed?

Prof. Edwards: Usually they will dry in a few minutes sufficiently to run through the seeder. Spread the seed out in a layer an inch or two thick on a clean floor or canvas.

Q.—Would it injure it to dry it in the sun?

Prof. Edwards: We don't think so, although we always say it is better to dry it in the shade. It would perhaps be a little safer. We haven't, so far, made any direct experiments to prove how long it could withstand the direct sunlight. Keep it as moist as possible in order to keep the bacteria alive.

Mr. Monteith: If you keep stirring it with your hand, it will dry very quickly.

Prof. Edwards: Yes, half an hour will dry it easily if you keep stirring it. How long did you find it actually took for drying?

Mr. Monteith: I don't think more than ten minutes.

Q.—Is it possible to use part of the culture and reserve some for later in the season?

Prof. Edwards: After the bottle is once opened there are apt to be moulds get in from the air and contaminate the culture. We don't know that moulds will harm them, but we feel that it is safer to keep the culture pure, and in that case it is better to have a new culture for each seeding.

Q.—How do you make that culture?

Prof. Edwards: We secure the nodules from the roots of alfalfa or other legumes, cut them open with a sterile knife, remove a little of the tissue from the centre of the nodule to our culture plates. By and by colonies of the bacteria develop, which we transplant to test tubes and this we call our stock culture. From this stock culture we can by successive transplants make as many sub-cultures as we wish.

Q.—I am feeding alfalfa right straight along. Now, would this manure from this feed that we are feeding now answer for that?

PROF. EDWARDS: I am not prepared to say whether it would or not. I may say, though, that the bacteria are contained almost altogether, if not entirely, in the roots of the plants. So, of course, most of them are left in the soil. Probably there would be some of the bacteria on the plants themselves, from the dust of the upper layers of the soil. Has anyone any experience to show that, in growing alfalfa?

Of course, if you take the soil from a field that is already established, and spread over the field to be seeded at the rate of two or three hundred pounds per acre, that will inoculate the field. That, I may say, is a very satisfactory method, and where a man has a field already established on the farm it is easier carried out. The difficulty with that method where alfalfa has not been grown on a farm or in its immediate neighborhood is that you run the chance of introducing weed seeds and germs of plant diseases.

Q.—How long will the bacteria remain alive?

PROF. EDWARDS: They will be good for at least one season. Where a crop has been grown on a soil, that is within comparatively few years, if the crop was successful, and if there were lots of nodules on the roots, the soil would remain probably well enough inoculated, so that no inoculation would be necessary. But where peas, alfalfa, or beans, have never been grown, then it is safer to practice some method of inoculation. The bacteria from one crop do not inoculate another crop. Alfalfa will not inoculate peas, or *vice versa*. You need alfalfa to inoculate alfalfa, and so on. They don't cross-inoculate, except probably in very rare instances.

Q.—Will bacteria remain alive on seed that is sown like fall wheat, if not plowed in?

PROF. EDWARDS: More or less, yes. It depends a great deal on the weather. Of course, they are exposed to sunlight there, and are apt to dry.

Q.—Is the soil treatment any more efficacious than the artificial culture?

PROF. EDWARDS: I cannot say. There is no reason why it should be; because if the culture contains a sufficient amount of living bacteria to inoculate the seed they are all there and ready for business, so to speak, when the seed germinates. I cannot say that there will be any more reliable results from the use of soil than the use of cultures, if the cultures are in vigorous condition.

RESULTS OF CO-OPERATIVE EXPERIMENTS IN APICULTURE.

MORLEY PETTIT, PROVINCIAL APIARIST, O. A. C., GUELPH.

During the season of 1911 the following co-operative experiments were sent out:

1. The Prevention of Natural Swarming in the Production of Extracted Honey.
2. The Prevention of Natural Swarming in the Production of Comb Honey.
3. Races of Bees—General.
4. Races of Bees—With reference to their power to resist European Foul Brood.

The instructions for experiment No. 1 were the same as last year. For experiment No. 2, as the management for comb honey production is so different from that followed in the production of extracted honey, special instructions had to be

prepared. To meet all requirements, the form of instructions was altered considerably from last year. Instead of the large sheet, which was to be nailed to the wall of the honey house, or work room, a bulletin was prepared entitled "Natural Swarming and How to Prevent It." This bulletin gives the general principles underlying the swarming problem and the management necessary for prevention. Along with this, two circulars were prepared, one called "Experiment Number One," explaining in detail the management for the prevention of swarming in extracted honey production. The other, called "Experiment Number Two," explaining in detail the management for the prevention of swarming in the production of comb honey. In making application for the experiment, the experimenter was required to state whether he wished experiment for the production of extracted honey, or comb honey. Those of the first class were sent bulletin on "Natural Swarming and How to Prevent It," also circular Number One and a report blank for reporting the experiment in the Fall. Those of the second class were sent bulletin on "Natural Swarming and How to Prevent It," and circular Number Two, also the report blank. During the summer, circular letters were sent to these experimenters occasionally, reminding them of the fact that they were performing an experiment for us and that we would be expecting a reply from them in the Fall, whether the experiment was successful or not.

The experiments in races of bees consisted in sending out queen bees for testing some of the different strains advertised in the Bee Journals. These were offered to the experimenters who showed sufficient interest in the work last year to report on their experiment, or give a good reason for not doing so, and this only on condition that a promise be given to, if possible, continue the experiment through the season of 1912. Application blanks were enclosed with the offer. Most of them filled their application and received one queen bee each. It will take another year to get a report on these.

In reference to European Foul Brood, it seems well established that certain races of bees are better able to resist this disease than others. Some few strains of Italians have been found by experts to be in this class and are recommended for use by Inspectors of Apiaries. Others are good honey producers but have not been tested in this respect.

In order to test the matter more fully, arrangements were made with a number of beekeepers in the E.F.B. districts of Ontario to test the queens from a few breeders whose bees have been specially recommended. A few satisfactory reports were received from them this year, and a full report is expected in 1912.

Swarm Prevention and Extracted Honey.

Instructions for this experiment were almost identical with those sent out last year, and although there was almost an entire change of experimenters, the results are even more satisfactory than in 1910. The main difficulty is in arousing sufficient interest to get a beekeeper to do something for his bees every week. He will feed his horses or hogs alright, because they would die or squeal if he did not, but the bees will exist, and even yield some profit when left to themselves, and he thinks it is "less bother" to be compelled to hive swarms at inconvenient times—or let his wife hive them—than to be systematic about the work.

Then there are those who receive the experiment and try it out fairly well but fail to finish it up by keeping the honey from the two lots separate so as to compare results.

There are also those who fail to report on the experiment the second year. The educational value of what we send out is not entirely lost on any of these

persons, but they not only fail to get the best out of it, but they fail to co-operate and give others the benefit of their experience with the information handed them. There is no doubt that the fact of its being a poor season prevented a great many from finishing the experiment.

Of the persons who undertook the experiment thirty-five sent reports, from nineteen different Counties of Ontario. These reported a total of 991 colonies in the Spring of 1911, and 1,325 colonies in the Fall, being a spring average of 28.3 and a fall average of 38. Their total honey crop was 65,000 lbs. an average of 65.6 lbs. per colony spring count, 50 lbs. being white honey and 15.6 lbs. being dark honey from fall flowers.

The groups of hives used for the experiment averaged 8 hives each. The group being divided into Lot A, consisting of 4 hives managed according to directions; and Lot B, 4 hives, allowed to swarm naturally. As the experimenters were nearly all new this year the per cent. of natural swarms from Lot A was still high, being 24 per cent., but even this was far less than Lot B, which was 70 per cent., a difference of 46 per cent. of swarms in favor of the method described in the experiment.

The average honey yield was 11 lbs. per colony more from Lot A. than from Lot B. That is if the colonies owned by experimenters had all been managed according to directions, their honey crop would have been increased more than 10,000 lbs., which means that they lost in the aggregate over one thousand dollars by careless methods of management, to say nothing of the loss of run-away swarms, which is considerable.

Some experimenters appreciated the value of the experiment, others did not. A notable example of the latter class is a man whom we shall call Mr. X for the sake of not telling his name. Mr. X is a beekeeper in Ontario who tried the experiment for swarm prevention. He put 10 colonies in Lot A. to be managed according to directions and 50 colonies in Lot B. to be managed by his own plan, which was simply to let them swarm. He secured 400 lbs. or an average of 40 lbs. each from Lot A, and 1,600 lbs. or an average of 32 lbs each from Lot B., being a difference of 8 lbs. per colony in favor of Lot A. Now if he had handled the fifty colonies the same as lot A. he would have had 50x8 = 400 lbs. more honey worth $48 at wholesale rates. The extra time it would have taken would not be more than six days at the outside. Against this we must balance fully two days time spent in hiving the 32 natural swarms he had from Lot B, reducing the cost of the extra $48.00 worth of honey to four days of time, to say nothing of the time the bees lost swarming and the swarms that went to the woods.

Now what does Mr. X think of the experiment? *He reports that he has derived no benefits whatever from the experiment.* He finds that his own method suits him best, as he has *less bother.* Does this mean that Mr. X is a wealthy man keeping bees for pleasure, or that his time is worth more than $12 per day at something else? You may say that he had the extra 32 swarms, but these could have been made artificially during the six days with no cost to the honey crop. However, most of the experimenters are able to do arithmetic, and figure out profits a little more accurately than Mr. X. The following is a list of benefits derived by individual experimenters:

"Can keep them from increasing so fast and get more honey."—Bruce County.
"Saves time and stimulates my own experience."—Elgin County.
"Had the interesting experience."—Lanark County.
"My own plan is good, but your's is better; it is more systematic."—Middlesex County.

"Better knowledge of Bee keeping."—Ontario County.
"My method was similar to your's, but in 1910 I tried natural swarming, and I am satisfied that the method is better, because you can depend on leaving your apiary for a week at one time; but when natural swarming is practised, you cannot leave and attend to anything else. The only thing I think has to be watched is not to overdo the shifting of brood."—Parry Sound District.
"Pleasure and experience."—Russell.
"You know what your colonies are like at all times."—Simcoe.
"I learned some things that helped me well."—Simcoe.
"Your method is the best I have tried yet."—Victoria.

These from experimenters who sent full reports.

The following are from those who were not able to report fully:

"Too much other work to attend to."—Elgin.
"I have been working on the same plan for years."—Grey.
"Your method is alright, and in some respects is better than mine. It is more thorough."—Middlesex.
"Your method enables me to control swarming."—Middlesex.
"Have a better knowledge of Bees."—Oxford.

Last but not least,—

"I have used the system for some years very satisfactorily. Had only one swarm altogether from 69 colonies, and extracted 9,200 lbs. of honey, an average of about 133 lbs. per colony."

And the beekeeper ten miles away says "I do not to much trouble with my bees now, I am 67 years old." This man had 60 colonies spring count and took 5,150 lbs. of honey, an average of 86 lbs. per colony or 47 lbs. per colony less than the man who cared for the bees. The difference of only ten miles location, would not be likely to make so much difference in the crop.

Experiment No. 2.—Swarm Prevention in Comb Honey Production.

For this experiment the bulletin on "Natural Swarming and How to Prevent It" was sent to each experimenter, also circular marked Experiment No. 2, which after stating the purpose of co-operative experiments and telling how to choose experimental groups, give the following instructions regarding:

Comb Honey and Swarming.

For Comb Honey Production the work in the supers has to be so crowded to get well-filled sections that it is practically impossible to keep the bees from contracting the swarming impulse. In fact the best work in Comb Honey Supers is usually done by first swarms newly hived on starters. They are full of energy due to the completely changed conditions, they have no brood to care for and having narrow foundation starters instead of full sheets or combs in the brood chamber they throw their working force strongly into the supers.

About the only way to avoid having natural swarms is to make artificial ones. Just as good results are obtained and the expense is far less, when artificial swarms are made properly.

Artificial Swarms.

In the first place every effort is made to retard swarming, by putting on extracting supers and gradually enlarging entrances during fruit bloom. When white honey begins coming in, the extracting supers are removed and comb honey

supers put in their places, without queen-excluders. Entrances are enlarged to the full width of the hive and an inch or more in depth.

When on the weekly examination we find queen cell-cups with eggs and the indications point to swarming impulse it is time to make an artificial swarm. This is done as follows:—

First, a hive filled with frames containing half-inch starters of foundation and one worker comb in the middle is set on its bottom board a few inches behind the hive to be treated. The operator, who sits at the left of the hive, removes two frames from the new hive and shoves over the remaining frames so as to have the empty space next him. He now lifts the comb nearest him from the brood chamber, shakes it almost free of bees, and places it in the new hive next the left wall, the next comb has a double space for shaking off bees in the old hive. It takes its place beside the first comb and the return motion of the hands carries a frame with starter from the new hive to the old. Comb number three is shaken, carried to the new hive and frame number two is brought back. The fourth frame exchanges places with the third comb and so on. If any good capped queen cells are found they may be saved and introduced to nuclei for queen rearing. In this case they must not be shaken, as a sudden jar is liable to injure or kill the embryo queens within. See that the old queen is not left on the brood. When the last comb has been shaken in its own hive and transferred to the new, and the old hive filled out with the starters, we put on the supers, close the hive, and the bees have been swarmed.

There is now a swarm hived on starters on the old stand, under conditions fairly natural, at the convenience of the beekeeper, without fuss, excitement or acrobatic feats. Leaving them in the old hive is merely a matter of convenience.

If there is no honey in the supers it is best to smoke and disturb the bees and give them time to fill themselves before shaking, but if the supers contain honey this is not necessary.

These swarms behave in all respects like natural swarms just hived. If they swarm out next day, so would natural swarms under like conditions, and the same little devices must be used to keep them contented.

The empty comb in the middle is useful for various things. It catches pollen which might otherwise go up into the sections. It also helps to make the new swarm contented.

A few minutes after shaking, swarms sometimes show signs of queenlessness. The queen has been accidentally left with the brood, or in rare cases has been lost. In this case we do not bother hunting the queen, because she will do no harm with the brood, unless it is to be given to another colony.

Give this queenless swarm a comb of open brood and eggs; they will start cells and at the next visit all but the best cell must be destroyed.

Uses of the Brood.

The queenless brood that is left from making an artificial swarm in this way may be put to different uses.

First, it may be used to fill up with brood the brood chambers of colonies in lot A which have not yet started swarming preparations. This will strengthen them and bring them on to be ready for swarming next week.

Second, it may be set above queen-excluders over these same hives for a week, then be used for making nuclei. Third, it may be left where it is in the new hive directly behind, or at one side of the swarm, with sufficient bees to care for the

brood, and a good queen cell left unshaken for the purpose, or a laying queen introduced. This "parent hive" as it may be called is given an extracting super at once, and is removed to a new stand at the next weekly visit, in order to weaken it and throw an extra supply of workers into the swarm working on sections.

Whatever disposal is made of the brood it must not go to any colonies outside of lot A as that would spoil the result of this present experiment. Queen cells may be taken from lot A for use elsewhere in the apiary, but nothing else.

At the next weekly visit brood chambers of swarms are examined to see that the queen is alright, and of course the supers are watched from week to week and more room given as needed.

Drone Comb.

One disadvantage of hiving on starters is the great quantity of drone comb that will be built in the brood chamber. This cannot very well be avoided. Owing to the uncertainty of the honey season and the necessity of having sections well filled we must crowd the super work by giving little or no material to build on in the brood chamber, and the excess of drone comb is the result. As soon as the white honey is ready to come off, the frames containing most drone comb must be removed from the brood chambers and worker combs or full sheets of foundation put in their place. Then if the fall honey flow is not sufficient to fill these up for winter, feeding can be resorted to.

Eight persons tried this experiment and while sufficient information was not sent it to present any figures, the opinions of experimenters are of interest:

"It has taught me that it pays to control swarming to get a good crop of honey."—Grenville County.

"The benefits I derived are: More Honey and Less Work."—Russell County.

"More Honey and Satisfaction. Your advice and my Experience has done good."—Dundas County.

"I have derived a great deal of benefit from your instructions. I am able to handle my bees with more satisfaction."—Elgin County.

"I have learned to produce fancy comb honey, and interested others in Beekeeping."—Middlesex County.

Now although the number of reports received is small compared with the number of persons who applied for, and received instructions for the experiment, results cannot always be counted by figures, and the fact remains that carefully prepared instructions on one of the most successful methods of preventing natural swarming were sent to nearly 500 beekeepers, and that these beekeepers had had their interest awakened by filling out an application blank *asking for these instructions.* Many were unable to conduct the experiment because the bees were too much weakened by the late Spring, and the season was cut too short by the drouth for the swarming to develop under any conditions. Others were too busy with affairs which yield a smaller profit than the bees would give for the same attention.

The greatest hindrance to the honey industry in Ontario is not Foul Brood, serious as that may be, it is not the cold winters and late springs, and it is not the difficulty of controlling the swarming impulse. The greatest hindrance to the development of honey production in Ontario, is the *indifferent farmer*, who does not realize that while good horses, fat steers, and all the other live stock on the place will eat their heads off if he doesn't watch out, honey bees will gather honey which costs nothing, which is going to waste, and which will pay 50 per cent. to 100 per cent. dividends annually on time and capital invested.

When good extracted honey sells readily at a good price and the average crop ranges from 50 to 100 lbs. per colony, and 200 hives of bees require less work than a 50 acre general farm, how is it that the proper care of bees is "too much bother"?

CO-OPERATIVE FORESTRY IN ONTARIO.

(Illustrated with Lantern Slides.)

Prof. E. J. Zavitz, O.A.C., Guelph.

I would like to tell you briefly what the Forestry Department is doing, chiefly in connection with the co-operative work, and I would like to give you some idea of the position in which we stand in Ontario to-day.

This autumn I had the pleasure of going through south-western Ontario with some gentlemen from the Old Country, and on one or two occasions of travelling with men from Germany. I was surprised to find that they all gave thought to the same opinion. In going through the south-western part of this Province they were all amazed at the treeless condition of our country. I had known, of course, that our woodlands were in a very bad condition, but I did not think that it would appeal to these men so strongly. To show you the reason why this should appeal to these men, I would like you to compare the woodland conditions of the south-western part of Ontario with that of one or two older countries. This part of Ontario is a comparatively densely populated country, a good agricultural country, and contains about 20,000 square miles (this is the area lying south and west of the Trent Valley Canal region). This area has about 9 per cent. of woodland. This is based upon the assessors' returns, and includes the little clump of maple trees growing in the corner of what was once the wood lot, and includes in some cases good woodland. I might say that there are a great many townships in south-western Ontario which contain less than 5 per cent. of woodland. Prussia, a country with half the area, some 10,400 square miles, a country as you will all know, long settled, and very intensively cultivated, has to-day some 23 per cent. of woodlands, which are producing vastly more than our woodlands, and a large percentage of their woodlands are producing more than the best of ours. Another country, Saxony, containing some 6,000 square miles, has 27 per cent. of forest land, which yields an annual revenue of over $2,000,000. Now, you can realize how it appeals to a man from the other side of the water. It appears to him that we are in a very peculiar position. I said to some of these men that we were endeavoring to interest people in reforesting, this statement struck them as something remarkable. They thought we were still in the woods!

Now, we have two problems in the old agricultural portion of Ontario. We have the improvement of the woodlands now existing. I would not put forward for a moment any hope that in at least a large percentage of these woodlands we will get any improvement. It will be but natural to take the land for agricultural purposes. That is bound to come. I do not believe that any legislation or any form of education will prevent this from taking place on a great many areas which we call woodlands to-day.

I think, however, that our greatest hope lies in redeeming the non-agricultural soil. We have in this province a great deal of land which is really not agricultural. I have here a few lantern slides showing areas which are not favorable

to tillage. There is no question that the day will come when the owners will see fit to reforest these areas. It is a practical proposition, and I think that this is a plan which may be carried out so far as individual owners are concerned.

Then, we have in several parts of the province some 200 square miles—that is a conservative estimate—of lands lying in large areas of from 5,000 to 60,000 acres in extent, of non-agricultural lands. These waste lands, non-agricultural lands, are another source of hope in regard to the bringing up of our average of woodlands in the south-western part of the province. These lands are to a large extent sand formations.

Now, in connection with the work that is being carried on and which is related to this Union most closely, we are sending out forest planting material to the individual owners of land, and trees to plant. We have this year sent out 375,000, and to-day we have many plantations which in a few years will begin to create an educational effect. We have plantations in about forty counties. We have sent out about 2,500,000 trees. The details of these I need not go into.

I will now deal with a few lantern slides describing the nature of this work.

Prof. Zavitz then exhibited a number of lantern slides, explaining each one as it was thrown on the screen.

PRESIDENT CREELMAN: The greatest trouble the Experimental Union and College have to-day is to get the facts already proven into actual practice by the farmers themselves. In this forestry matter we are striking practically a new field, and it cannot be expected that we can make very much progress individually in getting men to give up land for reforesting. These large areas will, in my opinion, have to become experimental propositions. And I do not know any audience gathered together at any time who should be more interested than you who are here to-night. We have here our regular course students, the short course students, and the members of the Experimental Union. I wish to say this just as emphatically as I can, that as you find yourselves becoming citizens in this province you will do two things aside from everything else, aside from your farming. You will devote yourselves to the improvement of things in general in your district. When you go out do these two things: Remember that the farm upon which you live is a part of the township, and that the township is a part of the county, and that not only is your responsibility one of looking after your own particular farm or locality, but it is a responsibility to the municipality, and the municipality being owned by the people should receive some of your attention as a citizen. Then you lend yourselves to aid in the things that Mr. Zavitz speaks of in the forestry matter. Take a whole section of land in Norfolk, Elgin, or Northumberland, or in Durham, land that has no taxes payed upon it now, because these waste places must be taken up in the first place, in my opinion, rather by the citizen or the individual and improved to the extent at least of fencing it and putting one man on so many thousand acres, and permitting it to re-seed itself. If you do this, you have got a proposition, even if it takes fifty years, to produce revenue, a revenue which will come to the people. Now, you men as citizens have got to take this matter up. Mr. Zavitz goes to a township council or a county council by invitation, and it nearly always comes down to a matter of petty party politics. It comes right down to the working basis that they are not willing to look five years ahead and sacrifice themselves for a principle such as we have heard of here to-night. It is a municipal proposition, and you, as members of the Experimental Union, ought to be able to save this thing. I hope that every individual present will take this matter to heart, and, as a citizen, will go before

his township council, and persevere in his efforts until the proposal becomes popular, and we get it well started. If you want to do something for your country as well as the particular township in which you live, you cannot do better than give particular attention to a matter such as has been discussed here to-night.

REPORT OF THE EXTENSION WORK WITH THE SCHOOLS, AS CARRIED OUT THROUGH THE SCHOOLS' DIVISION.

Prof. S. B. McCready, O.A.C., Guelph.

This branch of the Union was organized in 1909, and has now completed its third year of operation. Its aim is to adapt the work of the Union to the schools of the province, and to induce teachers and boards of trustees to take up some phrase of it as a means of introducing a measure of agricultural training.

Signs are not wanting that the interest in the work is growing. There have never been so many enquiries regarding school garden work as we are receiving at present. The Department of Education advises teachers to secure the material and directions offered by us, and has appointed the Director of this Schools' Division to the position of Director of Elementary Agricultural Education.

The importance of some such work in the schools is not generally recognized. Everyone seems to think that the only ones to be considered in agricultural propaganda are the grown-ups. And so we have the Agricultural Societies and Horticultural Societies and Field Crop Competitions and Seed Growers' Associations and Farmers' Clubs and Farmers' Institutes and Short Courses, and a dozen other agencies at work, as well as High School Classes, and an Agricultural College for the young men. And with all these, only a fraction of the field is being covered —a few thousand people being reached. In the meantime, there are over five thousand country schools in session for over two hundred days in the year, with over two hundred and fifty thousand pupils in attendance. At least fifty thousand of these are in the higher classes and old enough to take advantage of any instruction that an enterprising teacher can give to them, touching on the common things of the field, the orchard, the garden or the stable—things that will be of vital concern to them from the day they leave school behind them. Here is the chance for the best investment of agricultural instruction that can be imagined! Just think what possibilities there lie in every twelve or fourteen-year-old boy on leaving school, if he knew the secrets of the weeds, the soils, and the grains, if he had been stirred into experimenting for himself through simple experimenting that the schoolmaster initiated him into; if he knew where to get and how to put to use the latest discoveries of our professional experimentalists. There would be no trouble then to get old orchards and old soils renewed, old weeds killed, old flat, stale, and unprofitable varieties replaced, new manures tested, new bulletins read, and new soils conserved. No. 21 barley and No. 72 oats, and No. 61 rye, and Davies' Warrior potato, which we heard about yesterday, would be grown everywhere in a twinkling—and possibly improved. Just think of all, or nearly all, our next generation of farmers being as progressive as the members of this Experimental Union! They tell us Ontario has not begun to realize a fraction of her agricultural possibilities. And she never will until the schools take a hand in the work of instruction. To bring about this "consummation devoutly to be

wished" in a rational, practical and pedagogically sound way, is the aim of the Schools' Division.

It is hard to say what is the one chief deterrent to the cause. Perhaps there is no one thing to explain it. It is not the teachers, for they—willing slaves—are ready to do what they must; it is not the programme of school studies, for this subject is included therein; it is not the Provincial Department of Education, for it officially encourages and subsidizes the work; it is not the press, for it preaches the cause week after week and year in and year out. The lack of progress seems to be due to a lack of public opinion. We haven't agriculture taught in our schools because we do not want it taught. We don't think our schools can do it, we know they never have done it, and we don't think children go to school for that purpose. The school's business is to prepare our children for the entrance examinations. And we won't have any trifling over it! Anything that does not serve to this end is tabooed. The devotion to examinations has warped public opinion into ruts that will not permit it to readily adopt a new groove. Demonstrations here and there are needed to arouse a right public opinion. In our little experimentings in our Schools' Division, we are doing a little in this direction. Here and there throughout the province schools are doing good work, so that in a few years to come I think it may be expected that possibly 2,000 out of 5,000 public schools will be doing some of this work.

The progress made during the past year has been quite marked, so far, at least, as one can judge by the increase in the number of schools taking up gardening. In 1910, there were fourteen school gardens in Ontario receiving special Government grants—these are gardens conducted by teachers who have been trained here at the College and hold a Certificate in Elementary Agriculture. In 1911 there were thirty-three such gardens. These thirty-three gardens were distributed as follows:—Brant County 2, Carleton County 3, Elgin County 3, Hastings County 1, Kent County 6, Lincoln County 5, Norfolk County 1, Ontario County 1, Perth County 2, Russell County 1, Waterloo County 2, Wellington County 2, Wentworth County 2, and York County 2. Fourteen counties are represented in this list, and Kent County has the largest number, having six, and Lincoln County next with five. The work seems to be more readily introduced in the western counties than in the eastern. With the exception of a very few, these schools took up some part in the work of the Experimental Union. I think only five out of the thirty-three schools have not taken up some one or more of the phases of the work of the Experimental Union.

The work of these schools does not represent by any means all the work carried on in the schools of the province. Many schools not receiving grants, carried on the work. In all we supplied 166 schools with materials for garden work. Besides the above thirty-three schools, twenty-two report carrying on school gardens, and sixteen report the work carried on in home gardens. Most of the schools (above one hundred this year) have not sent in reports. Likely many of these have had either home or school gardens. The failure of teachers to report is one of the disappointments of the work, but we hope to have this defect remedied in the years to come. The teachers don't seem to realize that they are under some obligation to let us know the results at the end of the season. Through the Inspectors we have learned of a few other isolated schools in which gardening was carried on. Taking all kinds of school gardens or school gardening operations into account, there were in Ontario during the season of 1911 ninety schools actively interested in the work, distributed as follows:

Brant County 5, Bruce County 4, Carleton County 6, Dufferin County 1, Dundas County 4, Elgin County 6, Grey County 4, Haldimand County 1, Hastings County 3, Huron County 2, Kent County 6, Lincoln County 6, Middlesex County 6, Ontario County 1, Oxford County 3, Peel County 2, Perth County 5, Prescott County 1, Russell County 1, Simcoe County 3, Victoria County 1, Waterloo County 6, Wellington County 4, Wentworth County 5, York County 4.

Nearly all the schools taking up this work are west of Toronto. Very few east of Toronto seem to have interested themselves as yet in the work, with the exception of Carleton County, which had six schools taking up the work.

It is likely this total of 90 schools would be more than doubled were we able to learn of them. For the future we shall endeavour to bring them all together into some common work, so that they shall be known one to another, and their work made known to the people at large.

The material distributed this year was much the same as in the previous years, and included garden seeds, agricultural seeds, weed seed collections, bulbs, shrubs, forest tree seedings, instruction sheets, bulletins, booklets on gardening for children, the O.A.C. Review, and some other things. In addition this year we made arrangements for putting the Government publications and agricultural texts into school libraries.

There has been quite a response to many of these offers from teachers who were not carrying on garden work, as well as those who had garden work.

The material sent out for the school experiment in agriculture this year was packages of the best O.A.C. No. 21 barley procurable. The plan called for its being planted in one-thousandth of an acre plots at different times, one week apart, to find the effect of delaying seeding. One good report was received from Miss Langsford, a teacher in S.S. No. 6, Fenelon Township, Victoria County. The work was done by a boy in the 4th class, on his father's farm, with the following result:—

Plot.	Planted.	Sprouted.	Headed.	Height.	Yield.	Remarks.
					ozs.	
1	April 27	May 7	June 15	2.1	17.00	Pint weighed 11.25 oz.
2	May 10	May 15	.....	2.6	12.50	
3	May 12	May 16	.....	2.6	11.00	
4	May 17	May 23	.....	2.2	7.75	
5	May 25	June 3	.....	1.8	7.25	

In order to have the schools understand the meaning of this little experiment we prepared a chart which shows the results of this same line of work done here at the College with wheat, oats, barley, and peas. This has been sent to all the schools which have returned reports. It is the first of our charts on agriculture for schools. We are looking forward to preparing others along many lines. If we could have every school assisting in the cause only in making good use of up-to-date charts that might be prepared a great work would be accomplished. If the schools in your district might be interested in this thing, let your teacher know, and get your supplies for this spring from us.

The work for 1912 is not yet definitely settled. Its extent and character depend somewhat on the decision of the Department of Education. That Department is very anxious to have this kind of work advanced, so that it may be expected that the work of this branch of the Experimental Union may soon be very greatly extended.

Q.—What is the grant for schools?

PROF. MCCREADY: Any school in Ontario which carries on school garden work and gives instruction in agriculture through the garden, having a certificated teacher in agriculture (that is a teacher who has been at the College here for two months, or at two summer sessions), receives for the first year $50. This is to pay for the manuring, cultivating, garden tools, and the fence and draining, if there should be any needed. The next year the school that carries on this work gets $30 a year. Besides this the teacher taking up this work and carrying it on satisfactorily gets $30 direct, not through the school trustees. So that this year there were thirty-three schools taking up this work, and the sum expended was $2,340, which was paid out by the Department of Education. I think it is desirable that something should be done to give any school that does the work at all in any creditable way some grant for it.

Q.—The shrubs are free, are they?

PROF. MCCREADY: No, these shrubs will cost about 35 cents each. We make an arrangement with a reliable nursery, and when we receive the orders we just turn them over to them. All we do is to make a good selection, and arrange for it to be supplied. The prices are good wholesale rates.

Q.—Who makes the application to you for the supplies for the school?

PROF. MCCREADY: The teacher generally. We do nearly all our work through the teachers.

Q.—Is that offer open to any school outside of Ontario?

PROF. MCCREADY: We have some of our old students in Prince Edward Island, Manitoba, and Quebec working with us, and they are very welcome. They are doing good work. But the money with which the work is done is Ontario money, and we could not expect to take up the work generally with schools outside of the Province.

Q.—Did I understand that the teacher has to have a special certificate before the school can take part in this?

PROF. MCCREADY: No. Any school in the country can get this material. It is only in schools that have one of those certificated teachers that get money for the work. I hope that there may be arrangements made whereby every school which takes an interest in the work will get assistance, whether they have a certificated teacher or not. We are planning this spring to send out O.A.C. No. 21 barley and the very best alfalfa seed. Alfalfa seed grown in Ontario is the very best seed to grow. If we can have some scheme in Ontario of charts like the one I have already referred to we could have agriculture taught by every teacher, whether they have taken a course at the Agricultural College or not.

Q.—Well, supposing the teacher has this College course and takes up this gardening too, do they have to pass an examination for the school section to get this $50?

PROF. MCCREADY: You can only get the grant if you have one of these certificated teachers, and the supposition is that with the trained teacher you could hardly have failure.

SOURCES OF GOOD SEED GRAIN FOR ONTARIO FARMERS.

PROFESSOR C. A. ZAVITZ, O. A. C. GUELPH.

Owing to the unusual weather conditions in 1911 the seed grain problem for the coming spring is of special interest. Throughout the greater part of Ontario,

the month of June was unusually dry and the month of July had a light rainfall and was excessively hot. The combination of the dry weather and excessive heat caused a decrease in yield per acre and also in weight per bushel of the cereal crops on many of the farms of Ontario. The grain crops of eastern and northern Ontario appear to be somewhat better than those in the south-western part of the Province according to the reports obtained through the Experimental Union and through the Bureau of Industries for Ontario.

A good many inquiries have already been received from Ontario farmers as to the best sources of receiving seed grain for the coming spring. This inquiry is likely to increase considerably as the winter advances and spring approaches. As grain for feed is not quite as plentiful as usual it will be a temptation to many farmers to feed the most of the grain which they have grown on their farms. As the prices for seed grain, however, is likely to be comparatively high it would be well for those farmers of Ontario who have good pure grain of leading varieties of farm crops to try to use other kinds of feed as much as possible and to sell the good seed grain. If this is carefully looked after it would probably be an advantage, not only to themselves, but also to other farmers.

Pure seed of a few of the very best varieties of farm crops are distributed throughout Ontario through the medium of the Ontario Agricultural and Experimental Union each spring. These are tested on the individual farms and as a rule the variety which proves the best in each experiment is sown in the following year. In a very short time the amount is increased sufficiently, not only to supply the necessary seed for the farm, but also to supply seed for selling to others. The seed which is distributed each year is perfectly pure. If the growers, therefore, continue to keep the seed pure these small lots used for the experiments should form an excellent source of seed supply for the different neighborhoods. There are hundreds of farms in Ontario which owe the source of practically all the seed which they are growing to the Experimental Union. We urge at this time that the farmers who have good pure seed of the Experimental Union varieties for sale this spring will let other farmers know these facts through advertising in the Agricultural Journals or in some other way. We believe that advertisments of this kind would meet with a ready response.

The Agricultural Societies of Ontario under the Superintendence of Mr. J. Lockie Wilson, are offering prizes annually for fields of standing grain in about one hundred of the local Societies which take up this important work. Judges are furnished to the various Societies who report on the condition of the grain examined in the case of every entry. These results are published in an Annual Report in which the names and addresses are given of those farmers who enter the competition and a record is furnished of the varieties grown and of the freedom of the crop from weeds, mixtures of other grain, smut, blight, etc. Copies can be obtained from the Department of Agriculture at Toronto through the medium of the Farmers' Institute or otherwise.

In connection with the Ontario Provincial Winter Fair held at Guelph in December of each year an official catalogue of entries for the Seed Department is issued. All entries in the general class are there recorded. Not only is the name and address of the exhibitor furnished but the variety of grain entered and also the amount of grain and price per bushel which the farmer has for sale is recorded. This catalogue also assists in locating good seed grain. It is possible that extra copies of this catalogue might be obtained from A. P. Westervelt, Secretary of the Winter Fair, Parliamen Buildings, Toronto, Ont.

The Canadian Seed Growers' Association is increasing in their work from

year to year. Arrangements have recently been made by which good seed grain which is being offered for sale by the members will be inspected by an official of the Dominion Department of Agriculture and the grain will then be sold in bags which are officially sealed under the authority of the Association. For fuller information in regard to this important source of good pure seed for Ontario application should be made to L. H. Newman, Secretary Canadian Seed Growers' Association, Canadian Building, Ottawa, Ont.

I have had a number of inquiries during the last two years in regard to the advisability of using western oats for sowing in Ontario. These oats are inspected and graded in the west and are sometimes shipped into Ontario in carload lots. I wish to caution the farmers of Ontario in regard to the use of oats from this source. The oats are graded in the west, not so much in regard to the variety or the purity for seed purposes, but more particularly from the standpoint of appearance and weight. In securing oats in bulk from the Western Provinces, therefore, there is very great danger of securing seed which is not at all suitable for sowing in Ontario for various reasons amongst which the following might here be mentioned:

1. Very carefully conducted experimental work has been conducted for many years in ascertaining the best varieties of grain for Ontario, through the Experimental Department of the Ontario Agricultural College and through the medium of the Ontario Agricultural and Experimental Union. It has been found that some varieties are decidedly better than others in productiveness and in quality. This information is now available to the farmers of Ontario and if they are looking after their own interest they will grow those varieties which are most suitable, not only for Ontario, but for their particular conditions. In securing the grain from the west it is difficult to ascertain definitely whether the grain obtained is of a good or a poor variety. In fact, in many cases the names of the varieties cannot be obtained and the grain may be a mixture of different kinds and, although the seed may be plump and of fine appearance, its results would be very uncertain.

2. As a rule there is no guarantee as to the purity of the seed obtained and there is not only a possibility but a probability that it may contain noxious weed seeds, some of which may not as yet be very troublesome in Ontario; such as, the Pennycress, the Ball Mustard, etc.

3. Owing to the peculiar weather conditions a large amount of the grain in the Western Provinces was not harvested before the frosts occurred in the autumn. It is quite probable that a considerable amount of the Western seed will be very weak in germinating power. From a letter received from the Official Seed Laboratory at Ottawa I make the following quotation:

"We are very busy looking after good seed grain for the farmers in some of the less fortunate districts in the Prairie Provinces compared with whom the farmers of Ontario have but little real cause for complaint."

In conclusion permit me to state that this subject was suggested by Mr. W. L. Smith, Editor of the *Weekly Sun*, Toronto, who realized the importance of discussing the good seed problem at the present time, and considered that the Experimental Union would form a good opportunity for bringing the matter before the farmers of Ontario. We have Mr. Smith with us at this time and I am sure we would be pleased to hear from him.

MR. W. L. SMITH, Toronto: I really did not come here to-day prepared to make an address on this subject. I know, just as every farmer here knows, that the quality of the seed is of more importance than practically any other thing in connection with the production of grain in the Province. My experience has been this year that grains were not only light in weight, but poor in other respects,

particularly in quality. I think Mr. Zavitz has given us a good deal of information on that point, that is, as to the sources where the supply can be obtained.

Mr. Lewis Toole, York County: I am interested in this clover question. For thirty years I have grown Alsike. For five years we have had failures, loss of our crop more or less, and this loss varies in different counties. This last year in the Eastern part of our Province and in the Central Counties we have had almost complete failures, and it is getting to be a vital question. You will find all over the Province that we are growing oats continuously, barley continuously and our leguminous crops are ceasing to pay, our land is going back continually; on good land that is worth from $60 to $100 per acre we are not getting nearly the return that we did a few years ago. The principal reason for that seems to be that we have had excessive heat and little moisture. The time was when it was not hard to make money in the Alsike business. We have made a specialty of that for many years, ever since I left this College. The first seed that I raised was as round as turnip seed. You know that when it matures well the seed is very round, but of late years it seems to me the loss of potash in the soil has caused it to become a little flatter in shape. Now, there is one substitute for that. How far, is the question, can we substitute alfalfa for this clover? I, myself, have spent $100 to $150 on clover seed alone that I have lost; not only lost it for one year but three years straight ahead. I got culture from here, and what is the result? The clover did far better where I put the culture on than where I did not put it on. On five acres of Alsike where I applied the culture and stirred it until it was dry, which only takes about ten minutes, the plants were strong and resisted the drought well, they withstood drought much better than that part of the field where no culture was applied. It was the same with the Alfalfa. The hay was much heavier and the plants came through the winter better. Now, the great question for this Province is this, how far can we substitute alfalfa for our clovers? In my opinion in a good many cases it would pay to do so.

IDENTIFICATION OF WEEDS AND WEED SEEDS AND METHODS OF ERADICATION.

(Illustrated by lantern slides.)

Prof. J. E. Howitt, O. A. C., Guelph.

The subject of the identification of weeds and weed seeds, and methods of eradication, is too broad and too comprehensive to be dealt with in more than a general way in the time allotted to it at a meeting of this kind. I shall, therefore, confine my remarks chiefly to general principles.

It is an undeniable fact that the weed problem is yearly becoming more serious in Ontario. Every year new weeds are introduced, old weeds more widely spread and in some parts of the province at the present time it seems almost impossible to keep a farm free from weeds. The increasing seriousness of the weed problem is due to many factors, chief among which are:

1. The lack at the present time of proper farm labour;

2. A want of a proper knowledge of weeds and weed seeds by those engaged in agriculture.

3. Carelessness, or in some cases ignorance, in buying clover, grass and seed grain.

4. Carelessness in methods of cultivation and lack of a proper system of crop rotation, due in many cases to attempting to farm more land than can be properly cared for.

5. The non-enforcement of the present legislation against weeds.

Now I have touched briefly upon some of the more important factors to which the spread of weeds and the increased seriousness of the weed problem is due. I shall now deal with some of the ways and means by which some of these factors may be at least overcome.

I shall take (1) general principles, (2) general methods and (3), if I may, make suggestions that the members of this Union might help in this fight against weeds and do much to lessen the seriousness of the weed problem.

1. The first essential is a knowledge of the common weeds and the common weed seeds which are to be found in clover, grass and seed grain. Every man engaged in agriculture should try to acquire this knowledge. In dealing with weeds, prevention and not cure should be the endeavor, and, if weeds are to be prevented, those who are engaged in the fight against them must know the bad weeds when they see them in order that they may be attacked and exterminated before they become established. The question that arises is how is the busy, practical farmer to get a knowledge of weeds and weed seeds. This he can do by availing himself of the means offered him by the Dominion and Ontario Governments; I refer to the Farmers' Institutes, the county representatives, and the short courses. These are available at the present time to the Ontario farmer, and he may, if he desires, receive much help from them. He must also put forward considerable effort on his own behalf. When any new weed appears on his farm which he does not know, he should take the trouble to find out what it is and not wait until it becomes established. This he can do by sending the weed to the Department of Agriculture at Ottawa, or to the Botanical Department here at the Ontario Agricultural College, and receive full information concerning it, free of charge.

2. Care must be taken in the buying of clover, grass and seed grain. Pure seed is the purchaser's right by law and he should insist on having it. There is a lot of impure seed bought in Ontario. I say "bought" because I really believe in many cases it is the purchaser's fault more than that of the seedsmen. He does not take the trouble to have the seed examined and tested, before buying, but purchases the first seed offered to him without regard to the purity, thinking only of the cost. There is no greater means for the dispersal of weeds than impure seed. Every year new weeds are introduced as impurities in clover and grass seed, and old weeds spread into new localities. Alfalfa has been very widely grown in the province during the last few years and several new weeds have been introduced as impurities in the seed.

3. Weeds along the roadsides, on the headlands, and in the fence corners, must be looked after and prevented from going to seed before they scatter their numerous seeds. So many farmers take great trouble to keep their fields clean by rotation of crops, after harvest cultivation, etc., and neglect this source of contamination from which their fields are constantly re-seeded. At the present time there is a law on the statute books of Ontario making it compulsory to cut certain weeds on the roadsides and in vacant lots, but in how many counties of this province is the law enforced? The law is dormant in most, and so it will remain until the farmer wakes up to the fact that if he is to have a clean farm, it must be enforced. I

think it is one of the functions of an Experimental Union of this kind to help to create a sentiment for the enforcement of legislation against weeds.

4. Co-operation seems to be essential if such weeds as the Perennial Sow Thistle are to be eradicated from a district. Very often some men in the neighborhood will be trying hard to exterminate such weeds as the Perennial Sow Thistle while their neighbors all around neglect them, and allow them to ripen immense crops of seeds which are blown far and wide by the wind, rendering nearly useless the work of those who are endeavoring to keep their farms clean. Every man in the district should at least take the trouble to cut his weeds before they go to seed and thus prevent his fields from being a source of danger and annoyance to his neighbors.

I shall now touch upon some of the general methods in dealing with weeds.

Crop Rotation is of utmost importance in dealing with weeds. Some sharp short rotation of crops should be adopted which will allow of the frequent use of the cultivator, the cutting of the flowers before seeding, and the introduction of a smother crop or a hoed crop. One cannot recommend a system of cropping which will be suitable to all kinds of farming. Each farmer must select the rotation most suitable to his conditions, keeping in mind those features of rotation which will best enable him to fight the particular weed or weeds with which he has to contend.

Hoed Crops. The growing of hoed crops, such as potatoes, roots and corn, provides a means by which many weeds may be effectively fought. If this method is to be effective, however, great attention must be given to proper cultivation. Many men seem to think that the name "hoed crop" alone is going to destroy weeds, and they neglect it, and the crop that is meant as a cleaning crop becomes the dirtiest crop on the farm and a source of contamination to every field on the farm.

Summer Fallowing. This method is extremely efficacious with all sorts of weeds, including the Perennial Sow Thistle. By fallowing for weeds a bare fallow is meant, or at least one which is given sufficient cultivation to prevent weeds from reproducing themselves by seeds or roots. A neglected fallow is nothing more or less than a weed bed and is useless and a danger to every field on the farm. The chief objection to fallowing is the lying idle of the field for a season, but this is probably offset by the effectiveness of the method in dealing with such weeds as the Perennial Sow Thistle as compared with other methods which require a great deal more labor, time and attention.

Early After-harvest Cultivation. This is one of the best ways to destroy annuals and winter annuals, such as False Flax, Corn Cockle and Wormseed Mustard. Plow early immediately after harvest and harrow and cultivate frequently. By thorough plowing the weed seeds are kept near the surface and by a frequent stirring of the soil they are made to sprout, and having sprouted they are easily destroyed by further cultivation.

Seeding down. Fields over-run with some kinds of weeds, particularly annuals, may be cleaned by seeding to grass for hay or pasture. This method has the advantage of requiring little labor, which is expensive at the present time. Cutting the hay crop early will prevent most weeds from maturing any quantity of seed. Close pasturing, especially with sheep, will in time destroy most weeds, even perennials.

Sheep Destroy Weeds. A flock of sheep will do much to keep a farm free from weeds and it is to be deplored that more sheep are not kept upon Ontario farms. Those of us who have been around and have had an opportunity to notice the difference between farms where no sheep are kept and farms where a number

of sheep are kept, are fully persuaded that the weed problem is very much less on the farms where sheep are kept than on the farms where no sheep are kept. This is very noticeable in driving through sections of the province where sheep are kept; in these sections the roadsides will be found bare and free from weeds, while in sections where sheep are not kept frequently the roadsides will be covered with many kinds of noxious weeds.

Smothering. The aim of this method is to kill the weeds by depriving them of light and air. This is accomplished by getting some quick growing crop, such as rape or buckwheat established on the land while the weeds are in a weakened condition. The result is that the smother crop soon occupies every available foot of the land and forms a continuous shade in which the weeds in their weakened state cannot continue to grow.

Hand Pulling. Hand pulling and the total removal of weeds is the most effective means of destruction, but of course is only practicable with shallow rooted weeds not very abundant in a field. Small patches of perennial weeds can be destroyed by digging out the plants with a fork, roots and all, and burning them. Great care must be taken to get every bit of the "root," and the patch should be watched, and, if new shoots appear, they should be taken out at once. In an ordinary season several diggings will be required in order to completely exterminate a creeping perennial.

Chemical Sprays. There are too many men looking for some easy way to destroy weeds, looking for some cure-all that will destroy all kinds of weeds. Now it is not to be expected that they will ever find such a panacea. Chemical sprays, however, such as iron sulphate and copper sulphate, can be successfully used in dealing with such weeds as Mustard. Spraying Mustard with a 20 per cent. solution of iron sulphate when the plants are beginning to show bloom will destroy the Mustard plants without in any way injuring a cereal crop. Promising results have also been had from spraying Ragweed with iron sulphate. The Ragweed has been destroyed in an oat crop without injury to the crop, and in the part of the field sprayed the crop was much heavier than in that unsprayed.

Lastly, I should like to say that at the present time it is very hard to get definite information regarding the best methods of dealing with the different kinds of weeds, and it has occurred to me that this Experimental Union might do something in the way of conducting experiments from which we could get some definite basis upon which to base our recommendations in regard to the destruction of weeds. It seems possible that the members of the Union who have certain weeds on their farms might co-operate and carry on experiments as to methods for their eradication, and careful reports of these experiments might be made and the results tabulated, and a summary of these results reported at the annual meeting of the Union. These results would give us something definite upon which to base assertions in regard to the destruction of weeds. At the present time one man will claim that one method is effective, while another man will claim that it is of no use whatever. If you had thirty or forty men who had tried a certain method and who found it effective, you would then have evidence that could be relied upon.

We have dealt with the general principles and general methods in the control of weeds. I shall now show you some lantern slides of the more common and injurious weeds found in Ontario, and at the same time give you some brief information regarding them.

Wild Oats.

This is a weed which is too well known to require any detailed description at the present time. I shall, therefore, touch only upon the methods for eradication.

Eradication: On a field infested with Wild Oats cereal crops should be dropped out of the rotation as far as possible and hoed crops, soiling crops, hay, and pasture should take their place. To get the land under grass it should be fallowed during part of the season, the cultivation being frequent and shallow to destroy all seeds that have germinated in the upper layer of soil. The land can then be sown with winter wheat and seeded, or with an early variety of barley which should be cut on the green side. The treatment mentioned is suitable for pasture land or land which has produced a hay or soiling crop during the fore part of the season. Two hoed crops in succession will do much to exterminate this pest.

Twitch Grass, Couch Grass, or Quack Grass.

This is one of the worst perennial weeds that we have in the Province of Ontario, and it is very difficult to eradicate on account of the creeping rootstocks which, when broken up, will grow at every joint and produce new plants.

Eradication: It can be controlled, however, by the following method: As soon as the crop is harvested, plow lightly, then harrow with the ordinary harrow and, if necessary, cultivate with a spring-toothed cultivator. This works the roots free from the soil and makes it possible to gather them up with a horse rake. Burn them as soon as they have dried sufficiently. Repeat this process two or three times. If the weather at this time should happen to be dry and hot, so much the better. Late in the fall rib up the land into drills and allow to stand for winter. The frost in all probability will render material assistance in the eradication. The following spring plow about the end of May and cultivate well, and put in some hoed crop or summer fallow, sowing buckwheat, the crop to be plowed in. A carefully cultivated crop of rape will be found to give excellent results.

Bladder Campion, Cow Bell or Bladder Weed.

This is one of the worst perennial weeds in the Province of Ontario and one which is becoming more widely spread each year as an impurity in clover seed. The seed resembles very closely that of Night-flowering Catchfly and is frequently mistaken for it. Many men, when purchasing clover seed, notice what they think to be the seed of Night-flowering Catchfly in the sample offered them. They know that Night-flowering Catchfly is not a very serious pest and accept the seed and by so doing take on to their farms one of the most serious weed pests to be found in Ontario. The Bladder Campion is easily recognized by its white flowers, surrounded by the bladdery calyx and by the very long, thick, deep roots. A good sized plant will have a root over two feet long with numerous deep rootstocks.

Eradication: A weed with such an underground root system is necessarily hard to combat. Some means must be taken by which the roots and root stocks can be destroyed. Small patches should be carefully dug out early enough in the season to prevent seeding, taking pains to get every piece of the root and rootstock. Badly infested fields should be plowed deeply immediately after harvest and then thoroughly cultivated and cross-cultivated with a broad-shared cultivator in order to cut up and weaken the underground root system. The following spring continue this deep cultivation at intervals of about two weeks until it is time to put on a hoed crop, which must be kept thoroughly clean in order to be effective. Corn has been found to be an excellent crop for this purpose.

Pennycress or Stinkweed.

This is another weed which has become more widely spread and more serious each year in Ontario. It is very abundant in Manitoba where it is considered the worst weed to be found in grain fields. The flowers are white and small with spreading flower stalks. The pods which succeed the flowers are very characteristic; they are flat and orbicular, about half an inch broad and notched at the top. In each pod are produced about twelve seeds, which are dark brown to black and oval in shape. An average plant produces about 20,000 seeds. Great care should be taken to prevent this weed becoming established on a farm.

Eradication: If a few patches appear, they should be hand pulled at once to prevent them from going to seed. If a field becomes badly infested, continuous growing of hoed crops with thorough cultivation thereof, followed by a heavy seeding with rye will do much to get rid of the pest. In places where the weed is very thick, mowing and burning is a good remedy.

Wild Mustard or Charlock.

This weed is too well known to require any description. It is found in nearly every section in Ontario and upon nearly every farm.

Eradication: It can be largely controlled by proper methods of cultivation or by repeated spraying with iron sulphate. The experiments conducted by the Botanical Department would indicate that 20 per cent. solution of iron sulphate should be used: (80 lbs. to 40 gals. of water), and the field should be sprayed on a bright sunny day when the young mustard plants are well up and just about to come into bloom. If the solution is applied too late, some of the older plants will not be destroyed and may produce seeds, and the results, therefore, will not be entirely satisfactory. An ordinary barrel sprayer with a hand pump or a potato sprayer with a broad-cast attachment can be used to apply this solution.

Dodder, Devil's Gut or Strangleweed.

This weed is spread as an impurity in red clover and alfalfa seed. In alfalfa fields it is a very serious pest. Dodder differs from ordinary weeds in possessing no leaves. The yellow thread-like stems of the plant twine around the clover plants and send into their tissues small short rootlets, which are called suckers or haustoria. By means of these suckers the Dodder draws from the clover the food necessary for its growth and reproduction. It thus kills the clover by robbing it of its food and causing it to starve.

Eradication: Great care should be taken to secure clover and alfalfa seed free from Dodder. Alfalfa seed containing this impurity is dear at any price. Small patches should be mowed, raked and burned early enough to prevent seeding. If by any chance some of these seeds are scattered before the patches are mowed, several thorough hoeings should be given in order to prevent any young plants from getting established. Badly infested fields should be plowed and put under a hoed crop for a season. Clover or alfalfa should not be sown in the field again for two or three years.

Blue Weed, Viper's Bugloss, or Blue Devil.

This is a biennial weed which was introduced from Europe. It is chiefly a weed of roadsides and permanent pastures.

Eradication: This weed gives very little trouble in arable land if the cultivation is at all thorough. In fence corners, on roadsides and in waste places, cutting below the ground with a spud is practically the only effective method of destroying the weed. Often, however, this is impracticable on account of the numbers.

Ragweed.

This is an annual weed which is very common in all parts of Ontario, and it is very hard to secure red clover seed which is free from Ragweed seeds. One important thing about Ragweed plants is that the flowers are of two kinds: those which produces stamens only at the top, and those which produce the pistils at the bottom. Many men in cutting Ragweed cut off only the top flowers which contain the stamens, and leave the lower flowers, which contain the pistils, to mature the seed. In cutting Ragweed, therefore, it must be cut near the ground in order that it may be prevented from seeding.

Eradication: In attempting to eradicate this pest, special attention must be given to fall cultivation to prevent the seeds from ripening. Gang plow, or cultivate and harrow stubble ground early after harvest and repeat cultivation at intervals until late in the fall. Then plow or rib up and follow with a hoed crop the next spring. Great care must be taken with the hoed crop that no specimens of Ragweed go to seed. When in grass go over with a mower in September or October if any plants are likely to mature seed. Avoid sowing late maturing crops.

Chicory or Wild Succory.

This weed is very frequently called Blue Weed but is not the true Blue Weed, of which we have already spoken. Chicory is a deep-rooted perennial weed, producing large, light blue heads of flowers, growing tall and becoming quite woody. It is seldom troublesome in well cultivated fields.

Eradication: If a field becomes badly infested, it may be cleaned by deep, thorough, fall cultivation followed by a hoed crop the next season.

Perennial Sow Thistle.

This is regarded as the worst weed pest in Ontario, on account of the fact that it reproduces so freely by means of seeds and by rootstocks. It can be recognised from the other comparatively harmless Annual Sow Thistle by the large orange-yellow flower-heads, which are an inch or more in diameter, and by the numerous creeping rootstocks which it produces.

Eradication: One of the best methods of dealing with this pest is to cultivate the field until about the middle of June, running over it frequently with a cultivator so as to keep the tops down and thus weaken the "roots." Then apply manure at the rate of about twenty tons per acre—12 good loads. Cultivate the manure in thoroughly with a double mould board plow, ridge up the land, making the ridges about 26 inches apart. On the ridges sow pasture rape at the rate of 1½ tons per acre. It is important that the right amount of rape should be sown. If too little is sown the stand will not be thick enough to smother the weeds, and, if on the other hand too much is sown, the plants will be too crowded and not grow vigorously enough to keep ahead of the thistle. Sow the rape when the land is sufficiently moist to ensure quick germination of the seed. If the rape is slow in starting, the Sow Thistle may get a start in the rows and thus necessitate hand

cultivation there. Cultivate the rape every week or ten days until it occupies all the land and makes further cultivation impossible. If, when the rape is cut or pastured, any Sow Thistles remain, the field should be ridged up last thing in the fall and put in with a hoed crop the following year. This, however, should not be necessary if a good stand of rape is secured.

REPORT OF COMMITTEE ON IMPORTATION AND DISTRIBUTION OF NOXIOUS WEED SEEDS IN SCREENINGS.

Prof. R. Harcourt, Chairman.

About two years ago the Committee on Commercial Feeding Stuffs was able to report that a law had been enacted by the Federal Government to deal with the sale of mill by-products in this Province. This was the work of the committee and they asked to be dismissed. But the members of the Union considered it better to keep the same committee in force to enquire into the subject of the importation and distribution of noxious weed seeds throughout Ontario. The subject has been up for discussion for some three or four sessions of this Union, and we need hardly go into it at this time to show to what extent these seeds are being sold in our by-products. Last year the Dominion Seed Commissioner made a report to the Union and stated that he had made certain recommendations to Mr. Fisher, the Dominion Minister of Agriculture. Mr. Fisher was also at the meeting, and he stated that he was willing to do anything that was in his power to bring about some legislation to restrict the importation of weed seeds. He thought, however, that the Dominion Commercial Feeding Stuffs Act either did control it at the present time or could be amended so that it would control the question of the weed seeds, and that he intended to take it up with his colleague, the Minister of Inland Revenue, and see what could be done. Since then there has been the change in Government, and it is for the committee to gather further information and to bring the whole matter before the new Minister; that will be our work during the coming year.

POTATO GROWING IN ONTARIO.

J. B. Fairbairn, Vineland.

I did not come prepared to give a report of my experience in potato growing this summer. However, I might say that experience to most of us at times is pretty costly. My experience this summer was not as costly as it might have been. I do not understand why the people of the Province of Ontario are called upon to import so many potatoes each year. During the past week I have had from Toronto—and my reputation is not very great yet—several communications asking for potatoes. I have replied each time, and word has come back stating that potatoes are being imported at the present time from England and from Ireland and can be laid down in Toronto cheaper than my quotations for potatoes in Toronto, and also cheaper than the quotations received from almost any other station in the Province. Potatoes in our own vicinity are very scarce, the demand is high, and we can get a better price right at home for our potatoes than can be paid by the commission merchants in the larger centres.

With regard to the early potatoes that I grew this summer, I might say that my soil conditions are not the most favorable for the growth of early or late potatoes. In addition to the soil conditions not being the best, the climatic conditions this year were also very much against them; we had exceedingly dry weather which was general throughout the Province. My early potatoes were the Extra Early Eureka and the Irish Cobbler. I know that Irish Cobbler is not considered to be an extra early variety, but it proved with me to be a profitable variety, and almost as early as the Extra Early Eureka. The Extra Early Eureka potatoes were planted on the 28th day of April, the Irish Cobbler seed was planted on the 29th. Three weeks later, about the 19th or 20th of May, I planted some Extra Early Eureka seed to which I had given a little special attention. I sprouted these potatoes before planting and removed all the sprouts but one, leaving the strongest sprout, and when it was time to plant, planted them all with the sprouts up and did not remove the lower end of potatoes. I believe if we had taken time to cut off the lower end we would have had still better results. I had one row about 80 rods long. It took my man and myself about two hours to set this one row, as we set each potato by hand. In less than two weeks this particular row showed a very marked difference from the other eight to ten rows that had been planted three weeks earlier, and, while I got potatoes from those which were sown first, earlier, at the same time there was only a difference of two or three days. The late planted potatoes yielded more to the acre, more potatoes to each plant, and they were larger in size and a more marketable potato. These potatoes were ready for market about the second week in July, and I was fortunate enough to have no opposition in selling for nearly three weeks. I had potatoes, but my only trouble was I did not have enough. They were dug just as the hills ripened, some hills being earlier than others. The plants were not of the same size and stage of maturity, and naturally you could not go along and take them out by rows. We marketed a great many before the 1st of August, at a time when nothing was sold less than $2.40 a bushel and some sold as high as $2.70.

The late maturing potatoes were sown on the 8th of June and of a variety known as the Dakota Red. I was relieved yesterday to hear Prof. Zavitz say that the average this year was less than 100 bushels to the acre, indeed 85 bushels to the acre. I felt that my crop had not even come up to the average. The early potatoes, of course, produced a much smaller yield than the late ones. With me the early one averaged from 45 to 50 bushels to the acre. The increased price, however, made it profitable even with this low yield.

Q.—What are late potatoes selling for in the fall at the time of picking, or at the present time?

MR. FAIRBAIRN: I am selling them at my own place at the present time for $1.50 a bag. I believe that in Toronto they are about $1.20 to $1.25 per bag.

MALCOLM MCCORMICK: I make a business of growing potatoes, and we calculate that if we get from 60 to 75 cents a bag we are raising the best crop we can grow on the farm. However, this year we have been getting $1 to $1.15 all along. I have grown potatoes for the last ten years, have averaged eight to nine acres each year, and have never taken less than 150 bags to the acre. I have been making a few experiments and find, as Mr. Zavitz said yesterday, there are too many varieties of potatoes grown in Ontario at the present time. I do not know that I can agree with him in his selection of varieties. I have tried both the Empire State and the Delaware potatoes, and find the Delaware much the better potato, it is a larger yielder and better keeper. I got a sample potato from New York last spring and planted three pounds, and from this three pounds I obtained one hundred and sixty-four pounds.

I might say that I have had several requests for early varieties of seed. I do not keep any Eureka seed. I think that is one point that we ought to study a little more—where we are going to get our early potato seed. It might be well for us to get in touch with growers in Northern Ontario. I have had the greatest difficulty in getting good early potato seed.

Another point in growing garden crops, such as strawberries or any other garden crop, and I would have saved many hundreds of dollars if I had discovered this sooner: that you need to have the land well manured with good stable manure. We have got to have the constituents that are necessary in the soil to keep the moisture holding capacity present in the soil, this will carry you through any season. This year I used about sixty tons to the acre, and had a very good crop of celery, in spite of the very dry season, and celery requires a lot of moisture.

ALFALFA GROWING IN ONTARIO.

Professor C. A. Zavitz, O.A.C., Guelph.

During the past summer I made three trips to the counties of Lincoln and Welland and two trips to the county of Haldimand in the study of alfalfa seed production. In 1910 I had correspondence with about one hundred alfalfa growers and in 1911 with about five hundred farmers who are growing alfalfa seed more or less extensively. In this way a large amount of very valuable information has been obtained. Alfalfa seed is grown more extensively in the Niagara Peninsula than many people realize. From letters received in 1910 from over forty farmers who had grown alfalfa seed for five years or more it was learned that on the average of all of the farms for a series of years the average production of alfalfa seed per acre amounted to a little over two bushels, and the average price realized per bushel when sold from the farm was about $9. When we realize that in each case a crop of alfalfa hay has been obtained from the land in the earlier part of the season, and that an average of $18 worth of alfalfa seed per acre has been obtained from the same land as a second crop in the one season, we get some idea of the great value of this important crop. The alfalfa seed production will vary from probably one-half to seven bushels per acre. The yield of hay of the first crop in the season is usually from one and one-half to two and one-half tons per acre—the average being about two tons per acre. When the alfalfa is once properly established under favorable conditions it will continue to produce crops for many years in succession without re-seeding. The present year the seed is selling from the farms at from $10 to $14 a bushel and the hay at from $15 to $20 per ton. Those farmers, however, who know the value of good alfalfa hay as a fodder are very loth to sell their crop even at these prices. The yield of both hay and seed was a little below the average this season, the hay running at about one and one-half tons and the seed at about one and one-half bushels per acre.

Q.—How many crops of seed can you take from an alfalfa field?

A.—The production of alfalfa seed does not seem to injure the plants any more than the production of a crop of hay. I was in one field this summer which had produced a crop of hay and a crop of seed each year for twelve years in succession. I was in another field which had been cropped continuously for twenty-two years and another for twenty-three years. A large quantity of seed had been

produced from each of these two fields, but I doubt if seed was obtained in each of the years. It is quite probable that in some seasons two or three crops of hay were obtained instead of a crop of hay and a crop of seed. There are many farmers in the counties of Lincoln, Haldimand and Welland who have cropped their alfalfa fields constantly from ten to twenty years without re-seeding. I consider it better to obtain hardy alfalfa seed grown in Ontario than the more tender strains obtained from some of the Western States.

Q.—I would like to ask Prof. Zavitz why he would buy Ontario grown alfalfa seed in preference to that obtained from the West. Is there any special reason why alfalfa seed should not be obtained from the south-western States? I have grown alfalfa seed from the irrigated farms in the West where alfalfa was grown to the exclusion of many of the other crops, and where it would grow so abundantly that it would smother out practically all of the weeds. I have thought that possibly the alfalfa from the West would be cleaner than that in Ontario.

A.—I think we have good reasons for being very cautious in the use of alfalfa obtained from the Western States. Much of the alfalfa grown in Utah, Nebraska, Colorado, etc., was grown by the Spaniards in South America and in Mexico, from which countries it gradually spread northward into California and from there eastward into the states referred to. Experiments show that the seed which has been grown for a considerable number of years in the south is not nearly as hardy as some of the strains which have been grown continuously in a more northerly climate.

There are only two distinct varieties or species of alfalfa to which I would draw your attention at the present time, viz., the Common alfalfa (*Medicago sativa*) and the Yellow Flowered alfalfa (*Medicago falcata*). The Common alfalfa is the variety grown extensively in the warmer climates of the world. The Yellow Flowered alfalfa here referred to grows wild in a number of the European and Asiatic countries and in some instances extends far north into Siberia. The Yellow Flowered variety appears to be a very hardy strain, but it has not proven as valuable when grown by itself under cultivation. Different kinds of alfalfa when grown near each other naturally cross-fertilize. When the cross-fertilization takes place considerable variations are found in the colors of the flowers, some being violet or purple like the Common alfalfa, some yellow like the falcata and intermediate forms frequently showing greenish, blueish, and yellowish tinges. It appears that there is also a variation in the hybrid plants. Some resemble very closely the features of the Common alfalfa and others the hardiness of the falcata, while others will probably occupy intermediate places in these respects. From this explanation it will be seen that the hardy or Variegated alfalfa if grown for some length of time under severe climatic conditions there is likely to be a natural selection of the plants, the more tender ones becoming killed and the more hardy ones withstanding the severe conditions. This account of the Variegated alfalfa will probably explain the reason for the hardiness of the Grimm alfalfa of Minnesota and the Variegated alfalfa, both of which have a most interesting history. In 1871 two pounds of alfalfa were sown near Thorold, Ontario, and from these two pounds increases were made from year to year until this spring has spread to many farms where the same strain is still grown without the introduction of any seed from another source. It is believed that a considerable amount of the Variegated alfalfa now grown in Lincoln and Welland traces its history to this source. It stands to reason that this Variegated alfalfa seed which traces its history in Ontario for forty years will be much more hardy than the Common variety from

the south-western States. Experiments conducted in the United States and Canada prove this to be the case even before the history of our Ontario Variegated alfalfa had been traced.

Q.—Can you give us the name of a firm where we can get the Grimm alfalfa?

A.—A. M. Lyman, Excelsior, Minn., is the man from whom we usually obtain the Grimm alfalfa, but the seed is very expensive.

Q.—Where can the Welland variety be obtained?

A.—H. A. Putman & Son, Silverdale Station, Ontario, buys, cleans, and sells a considerable amount of alfalfa seed, and he is more in touch with the growers of the Variegated alfalfa than any other person that I know of at the present time.

Mr. Telford (Elgin County): I only wish to say that I have been growing alfalfa for a few years and this summer I took off about 2½ tons to the acre, then I took a crop of seed and got a good fair yield, and after that the crop grew a foot in height.

SOME PRINCIPLES OF FARM MANAGEMENT.

G. F. Warren, Professor of Farm Management, Cornell University.

Unlike methods of feeding and fertilizing, the principles of farm management cannot be studied on a college farm. The facts for such work exist on the regular farms and nowhere else.

During the past six years we have been gathering records of receipts and expenses on New York farms in order to learn which farms are paying best and to find out how such farms differ from those that are not paying so well:

Table I.—Averages (Tompkins County).

Number of farms	615
Average capital	$5,527
Average receipts	1,146
Average expenses	389
Farm income	757
Interest at 5 per cent.	276
Income from unpaid labor	481
Value of unpaid labor, except owner's	58
Labor income	423

Table 1 shows the averages from Tompkins County.* The average capital on these farms was $5,527. This includes land, buildings, stock, machinery, tools, feed and seed on April 1st and cash to run the farm. The average receipts for the year were $1,146. Any unsold products or increase in animals is counted as a receipt. The average expenses were $389. This includes all business or farm expenses. It does not include any personal expenses, but includes the value of board furnished to hired help.

The difference between the receipts and expenses averaged $757.

This $757 was earned by the farmer's money and the work of the family. Money can readily be loaned on farm mortgages at 5 per cent. Hence, only $481

* For a fuller discussion of methods of work and other conclusions, see Bulletin 295 of the Cornell Experiment Station.

can be said to have been earned by the labor of the farmer and his family. The unpaid farm labor by members of the family would have cost about $58 if it had been hired. The farmer really earned as his wages $123. This we call his labor income. It corresponds to wages paid to a hired man, who also gets house rent and some farm products. Hired men get about $360, house, etc., in this region. If a farmer's labor income is less than this, he might as well lend his money and hire out.

About one-third of the farmers in Tompkins County are making less than hired men's wages: one-third are making wages: and one-third make more than wages.

Table 2 shows the same results for Livingston County. The region is a very prosperous one and gives an average labor income of $584:

TABLE 2.—AVERAGES (Livingston County).

Number of farms	374
Average capital	$10,548
Average receipts	2,172
Average expenses	980
Farm income	1,192
Interest at 5 per cent.	527
Income from unpaid labor	665
Value of unpaid labor, except owner's	81
Labor income	584

IS THE FARMER GETTING RICH? Is is perfectly evident that the farmer is not getting rich so fast as newspapers would have us believe. Similar work in New Hampshire shows that the farmers are not doing so well. Work in the Central West shows that the average is about like New York. Farming pays better than formerly. It is now possible to make a good living on the farm—a thing that was almost impossible twenty years ago, but I do not believe that the farmer is even yet getting his full share of the prosperity of the country. He is not yet able to pay wages that compare with city pay for such highly skilled labor as the farm demands. Some persons persistently compare farmers with unskilled city labor. But the farmer is a capitalist, business man, and skilled laborer. Very few skilled labor occupations are so difficult to learn. The farmer should be compared with the city business man who has a capital of $5,000 to $30,000.

Most of the great profits that the public attributes to farming have come from increased land values. For every farmer who has retired from profits in real farming, probably ten have retired on profits from real estate.

But some farmers are now doing very well. How do they differ from the average? The most important differences are in size of business, diversity of business and productiveness of crops and stock.

SIZE OF BUSINESS AND PROFITS. Tables 2, 3, and 4 show that capital is necessary for profits in farming. Capital is one way of measuring the size of business. Another way of increasing size is by area of the farm. When considering farms by area, the muck farms have been omitted. The following figures have to do with farms from which milk, butter, hay, grain, potatoes, apples, lambs, eggs, etc., are sold.

TABLE 3.—SIZE OF FARM RELATED TO PROFITS (586 FARMS, TOMPKINS COUNTY).

Acres.	Number of farms.	Average size (acres).	Labor income.
			$
30 or less	30	21	168
31— 60	108	49	254
61—100	214	83	373
101—150	143	124	436
151—200	57	177	635
Over 200	34	261	946
Average		103	415

Table 3 shows how important the size of the farm is in affecting profits. The farms of less than 60 acres do not give the owner farm wages. Table 4 shows the

TABLE 4.—AREA RELATED TO LABOR INCOME (578 FARMS, LIVINGSTON COUNTY).

Acres farmed.	Number of farms.	Average acres farmed.	Labor income.
			$
30 or less	17	20	54
31— 50	35	43	295
51—100	147	79	437
101—150	178	127	593
151—200	89	175	934
Over 200	112	305	1,082

same results for Livingston County. Evidently a very small farm is a great handicap. Eastern farms were laid out in the days of the grain cradle and scythe. They are not the proper area for efficient use of modern machinery.

TABLE 5.—SIZE OF FARMS RELATED TO LABOR (TOMPKINS COUNTY).

Acres.	Area farmed per $100 worth of labor.
30 or less	5 acres.
31— 60	12 "
61—100	18 "
101—150	22 "
151—200	26 "
Over 200	30 "

Table 5 shows that the area farmed with $100 worth of labor is six times as great on the largest farms as on the smallest. Table 6 shows that a horse farms three times the area on the largest farm as on the smallest. The horse is just as well off working as standing in the barn. The barn is better off as it does not get kicked so much when the horse has work enough to keep him happy.

TABLE 6.—SIZE OF FARM RELATED TO HORSES. (TOMPKINS COUNTY).

Acres.	Average Size (Acres).	Average No. of Horses.	Acres per Horse.
30 or less	21	1.4	15.0
31 — 60	49	2.3	21.3
61 — 100	83	2.8	29.6
101 — 150	124	3.4	36.5
151 — 200	177	4.3	41.2
Over 200	261	5.3	49.2
Average ..	103	3.1	33.2

Table 7 shows that while the small farms have very little machinery, yet they have too much per acre.

TABLE 7.—AREA RELATED TO EFFICIENCY OF MACHINERY.
586 Farms, Tompkins County.

Acres Farmed.	Value of Machinery.	Acres Farmed with $100 worth of Machinery.
30 or less	$125	17
31 — 60	243	20
61 — 100	341	24
101 — 150	495	25
151 — 200	592	30
Over 200	914	29

The area farmed with $100 worth of machinery is twice as great on the larger farms. The same conclusions are shown by the results in other counties.

If the farm is very small, it must have small fields if a rotation is followed. Small fields cannot be worked economically. Many farm operations require two men if they are to be done economically. The small one-man farm is wasteful of everything.

TABLE 8.—AREA RELATED TO UNPRODUCTIVE CAPITAL.
578 Farms, Livingston County.

	Per Cent. of Capital in Houses.	
Acres Farmed.	Value of Houses.	Per Cent. of Total Capital in Houses.
	$	Per Cent.
30 or less	1,494	43
31 — 50	1,000	23
52 — 100	1,236	18
101 — 150	1,477	14
151 — 200	1,810	13
Over 200	2,113	9

One of the most serious obstacles on the small farm is the amount of capital that is tied up in unproductive things. No matter how small the farm, the farmer needs a house. If he is to live as well as his neighbors, he must have as good a house on 20 acres as on 200. Table 8 shows that while the larger farms have more money in homes, yet the proportion of the capital thus tied up is much less. The barns on the larger farms are better, yet the money thus tied up is much less. A barn for ten cows costs more than half as much as a barn for twenty cows. A total of 62 per cent. of the money on the small farms is tied up in buildings, while on the larger farms only 20 per cent. is idle for this reason. Not only is the money in buildings taken out of the business, but buildings demand constant repairs.

Another way of measuring the size of farm is by the number of men. Again we find that the larger business pays better.

How Large Should a Farm Be. An efficient farm should have at least two men by the year. This will usually be a father and his son. Three men are much better. With general farming, this calls for four to seven horses and 200 to 300 acres of land. The upper limit of size depends much on the layout of the farm. With ideal conditions, with buildings in the center of the farm and with a public road going past the buildings, about 600 acres is the limit. More than this puts the fields so far away that the expense of hauling feed and manure is too great. It is not often possible to get over 200 to 300 acres well located. This area is enough to use buildings, horses and machinery to very good advantage.

Figure 1 shows two farms and part of a third as they were a few years ago. These small fields cannot be farmed to advantage. Figure 2 shows how they are combined and laid out for efficiency on the present 199 acre farms.

Effect of Larger Farms on Public Welfare. Many persons are afraid that the large farms will have poorer crops. The larger farms have as good or better crop yields as the smaller ones as shown by Table 10. The horses consume less in the production, so that more food is available for human use from the larger farms.

Table 10.—Size of Farm Related to Crop Yields (Livingston County).

Acres.	Average size, acres.	Acres per animal unit.	Yield per acre of:				
			Wheat.	Oats.	Hay.	Potatoes.	Beans.
30 or less.....	20	5.0	18 bu.	39 bu.	1.21 T.	92 bu.	18 bu.
31— 50.....	44	6.3	19	40	1.58	98	18
51—100.....	79	6.1	19	41	1.49	116	18
101—150.....	125	6.6	19	42	1.53	108	16
151—200.....	173	5.8	19	47	1.39	111	17
Over 200.....	300	5.9	19	43	1.45	116	15

Many editors are afraid that the larger farms will result in a laboring class with a few lordly overseers. If such persons will stop from their editorials long enough to look at the facts, they will find no cause for alarm. On the 200 and 300 acre farms, the owner works with the men. The men are usually his own sons or sons of neighbors who are working out to get a start. Later they will be tenants, then owners. On the small farms, the boys usually leave home because there is not profitable employment for them. The two and three-man farm is still the typical "family farm." With the scythe and grain cradle, the sons could be

FIG. 1.

Three farms as they were a few years ago, one of 90 acres, one of 100 acres, and one of 11 acres. On the three farms, there were 22 tilled fields, and 20 different areas of woods and pasture.

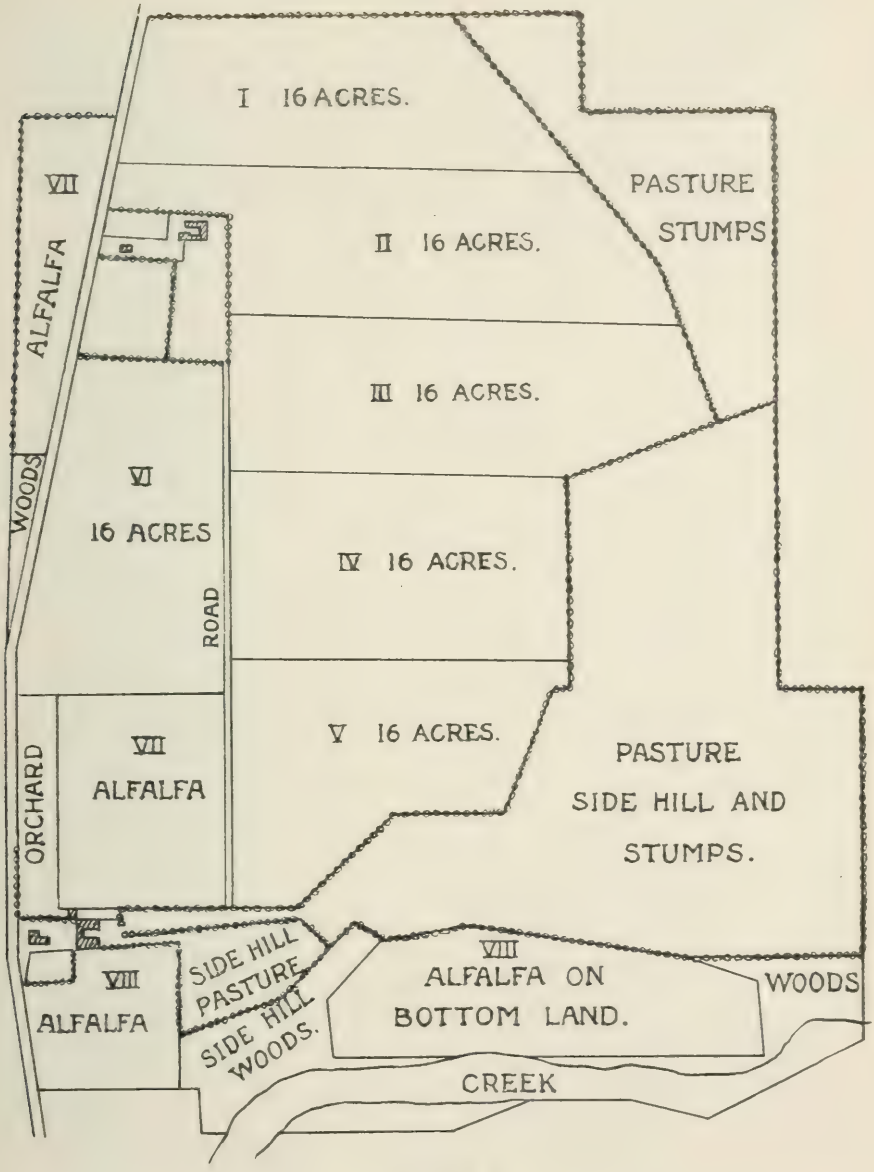

FIG. 2.

The three farms, as now combined into one farm of 201 acres, allowing for 32 acres of alfalfa and six fields for a rotation of corn and potatoes, followed by oats, wheat, and three years of timothy. Only half as much machinery is now needed; two less horses are required. The crops are now much better.

kept at home profitably employed on 100 acres. But with the mowing machine and grain binder more area is needed for a family. There is no danger to society from a farm that is large enough to provide work for one or two sons. Certainly this will not encourage families that are too large for public good.

TABLE 11.—RELATION OF CROP YIELDS TO LABOR INCOME (574 FARMS, LIVINGSTON COUNTY).

Percentage yield.	Average percentage.	No. of farms.	Labor income.
			$
75% or less	67%	58	165
76 — 85	81	60	219
86 — 95	90	102	663
96 — 105	101	116	570
106 — 115	110	103	878
116 — 125	120	66	951
Over 125	138	69	1,090

RELATION OF CROP YIELDS TO PROFITS. Table 11 shows that the better crop yields result in larger profits. Yet the best are not the fabulous yields that we hear about. The most successful farms usually get 10 to 25 per cent. better crops than their neighbours—not 100 per cent. better, as is often recommended. It is doubtful if it pays to try to get the largest possible crop. We do not have the climatic factors under control. These usually limit the crop. It pays to do our part for good crops, not for maximum crops; the season risk is too great for that.

TABLE 12.—RECEIPTS PER COW RELATED TO PROFITS (TOMPKINS COUNTY).

Receipts per Cow.	Number of Farms.	Labor Income.
$30 or less	18	$30
31 — 50	97	316
51 — 75	106	483
76 — 100	53	715
Over 100	33	1,325

Table 12 shows receipts per cow to profits. There is much more variation in animal production than in crops. The better farmers get 50 to 100 per cent. more than the average. With animals nearly all factors are under control, so that it pays to make the conditions right for at least 50 per cent. better production than the average.

Diversified Farming and Profits.

Table 13.—Diversity Related to Labor Income.
605 Farms, Tompkins County.

Receipts from Crops for $1 from Stock.	Per Cent. of Receipts from Crops.	Number of Farms.	Labor Income.
			$
No crops sold	0	29	113
$0.10 or less	4	46	348
0.11— 0.20	13	56	338
0.21— 0.50	25	144	452
0.51— 1.00	41	140	429
1.01— 2.00	58	102	440
Over 2.00	79	88	465

Table 13 shows that in Tompkins County the farmers who did not derive at least 20 per cent. of their money from the sale of cash crops were not doing very well. Not only were the averages poor, but the number of individuals who were doing well was much less than on the farms that combined cash crops with stock as shown by Table 14.

Table 14.—Diversity Related to Labor Incomes (Tompkins County).

Per Cent. of Receipts from Crops.	Number of Farms.	Per Cent. of Farmers making Labor Incomes of over $600.
0	29	0
4	46	17
13	56	14
25	144	22
41	140	27
58	102	24
79	88	37

Table 15.—Diversity Related to Labor Income.
578 Farms, Livingston County.

Per Cent. of Receipts from Crops.	Number of Farms.	Labor Income.
		$
20 or less	47	597
21 — 40	61	866
41 — 60	112	658
61 — 70	99	674
71 — 80	109	709
81 — 90	97	670
Over 90	53	414

Table 15 shows the same facts for Livingston County. The highest profits were made by combining cash crops with stock and stock products. Neither the straight stock farm or the crop farm pay as well as a well-balanced combination of the two.

The chief reason for this is that the combination allows for the better use of men, horses, and machinery. The dairyman who has help enough to milk can with the same help raise the feed and with little or no additional expense can raise some cash crops for sale, such as potatoes, hay, cabbage, apples, or some other desirable crop for the region.

We hear much of the profits from apple farms, but nearly all of the profitable apple farms have other crops so that the apples are not usually half the products grown. One of our noted apple growers in New York receives nearly as much for cabbage as for apples. He raises all his hay, oats, corn and frequently sells some. He also sells wheat, beans, lambs and hogs.

One of our most noted muck farms grows spinach, lettuce, celery, etc., and in addition runs a 100 acre farm with alfalfa, wheat, oats, and hay. This additional area is run with almost no extra cost. These cases are typical of nearly all of our most profitable farms. It is only by such combinations that the time can be fully and profitably employed.

One very profitable farm sells retail milk and pure-bred cattle. In this case, the same principle holds. The retail business takes the place of cash crops in keeping the men and teams busy.

On another successful dairy farm, the second business is keeping things clean. It is a certified milk farm. This is one of the few certified milk farms that pays. The owner does not have such extravagant buildings as to make this impossible.

Nearly every successful farm has two to four specialties. The general farm has sometimes been in disrepute as the farm that has a little of everything and little of anything. Such a farm may contrast unfavorably with the farm that has one specialty. But there is a third class of farms that are far ahead of either of these extremes. The most profitable farms nearly always have two to four important products to sell and more or less minor products.

Q.—Do the figures in this table include taxes?

PROF. WARREN: In this county, we did not include taxes. We are doing that now. It includes everything else, and ought to include the taxes, which were about $40.

Q.—Has there been any allowance made for what the farmer takes off the farm?

PROF. WARREN: The common wages there are $360 per year, plus house, plus some milk, wood, and other things the farm furnishes. The farmer got a little better than $30 a month with these things.

Q.—What size were the farms?

PROF. WARREN: The sizes there were 100 acres or a little over.

Q.—You have not allowed for depreciation in value?

PROF. WARREN: If there was depreciation, we took that off in the expense.

Q.—Do you think that $58 would hire the extra help on 100 acres?

PROF. WARREN: If there was depreciation, we took that off in the expense. the sons.

Q.—Where did you show the profit that your paid labor made?

PROF. WARREN: Well, we have not paid any attention to the hired man's profit in this. The average farm does not have a hired man, it only has half a hired man. It only has a hired man part of the year, and every cent that was paid to the hired man is included in the expense account, plus the board that was furnished him, if you boarded him. We put down $25 cash, plus whatever board was—about $12 a month.

Q.—Does the man on the small farm occupy himself altogether on the small farm, or has he a sideline?

PROF. WARREN: He hires out considerably to the neighbors, but that is included in his receipts.

Q.—Do those figures represent the owners of farms?

PROF. WARREN: Yes, those are all farms run by the owners. This shows that the men with the larger capital, the men taking the bigger risk, make the more money. Of course, they stand to lose more. It is the same in every business. Take the apple business for instance. If you handle 500 barrels a day you stand to make a lot of money, but you also stand to lose a lot. But you cannot make a large loss if you only sell an apple a day. If you sell a barrel of apples a day you can make a bigger loss, and if you sell 500 you can make a much greater loss. It is impossible with the peanut stand on the corner to make a large profit or a large loss. The chances of making a larger profit or larger loss increase with the size of the business.

Q.—Are those farms all workable land?

PROF. WARREN: About 70 per cent. of the land in Livingston County is tillable land.

Q.—How do you account for that difference in the yield, between the large and small farms?

PROF. WARREN: I am prepared to say that there did not seem to be much difference. If having a larger farm results in using a modern machine, it results in increased production.

Q.—Was the system of farming where there were about 30 acres or less, intensive farming or not?

PROF. WARREN: No, not particularly intensive. They are about all alike. We have intensive farming, but that is not included here.

Q.—Give us a method for keeping our boys at home.

PROF. WARREN: If there is good profitable work for the boys at home they will stay. If the boy can produce revenue, there is reason for him staying, but if the boy works all year and when the year is done everything else is done, what can you expect? I shouldn't stay on a farm if I were a boy if I didn't see in that farm that I was contributing to the welfare of the world, and the world measures that welfare by saying so many dollars worth. Some boys shouldn't stay on the farm, they ought to go to town.

Q.—Then why does the government advocate or try to get the people back to the land?

PROF. WARREN: The height of civilization is to be measured by that country which can produce food for the most people by the fewest people. Now, you cannot have civilization and have all farmers. The increasing percentage of improved farms means a smaller percentage of the population engaged in it. That gives chances for the boy to go to school more, for people to give the farmer better things. The only way that you can have civilization is to relieve the larger part of the people from farming, so that they can produce other things. You do not need to cry for the people to go back to the land. All you need to do is to check the movement away from the land. That has started now.

Q.—Do those results mean that you cannot feed all the crops on the farm and make good wages?

PROF. WARREN: These men have not been able to do it. The chances of making a good income without selling some cash crops are less. A combination of cash crops with animals pays best. If a farmer does not get at least 20 per cent.

of his money for cash crops he is not likely to do as well as his neighbor who gets 20 per cent. and does other things the same as he does.

Q.—What are the cash crops?

PROF. WARREN: That depends upon what he can sell. The most profitable kind of live-stock products in both counties was market milk.

Q.—What did the milk sell for?

PROF. WARREN: At Rochester market the prices averaged 3¾ cents per quart, and at New York 2 7-10 cents.

Q.—Do you have any combine amongst your butchers?

PROF. WARREN: I don't know, but the meat production would not pay as well as milk production. In other words, any farmer who keeps stock has time to take care of that stock and do something else. It is not that a man cannot make money with just live stock, but it is this: that having time to raise live stock and some time to spare, he can raise something else, and that is profit—anything to keep you busy between the milkings.

Q.—What was the most common breed of dairy cows in the two counties there?

PROF. WARREN: The Holstein. There were some Jerseys, they came next in number; and a few Ayrshires.

Q.—What about butter making? wouldn't it pay?

PROF. WARREN: I think that butter making on the farm would pay, if a man had a special market for his butter.

Q.—What price would you get per 100 lbs. for the creamery milk?

PROF. WARREN: $1.40, I think.

Q.—Could a man make a profit with a good orchard instead of keeping sheep?

PROF. WARREN: If he had a good orchard, yes.

Q.—Could he keep sheep in the orchard?

PROF. WARREN: Some of our farmers do keep sheep in orchards, but it is better to cultivate the orchard.

SOME WAYS OF GETTING STARTED IN FARMING WITH SMALL CAPITAL.

G. F. WARREN, PROFESSOR OF FARM MANAGEMENT, CORNELL UNIVERSITY.

Farming in America requires much more capital than formerly. In the days of our fathers, a scythe, grain cradle and a whetstone made up a large part of the farm equipment. It was then easy for a young man to start farming. To-day, if one is to farm effectively, he must have a large investment in machinery and horses, and must have a sufficient area to profitably employ this equipment. In addition, our land is becoming more expensive. As civilization progresses our necessary living expenses also increase.

EDUCATION NOW A NECESSITY.

If a young man wishes to start farming with no capital, the first thing that he should do is to get an education. The less money he has the more important the education becomes.

In Tompkins County, New York, the farmers who have attended a high school make wages (labor incomes) of nearly twice as much as is made by those who have attended district schools only.

TABLE 1.—PROFITS AND EDUCATION (573 FARMS OPERATED BY OWNERS, TOMPKINS COUNTY).

Education.	Number of farmers.	Owner's labor income.
		$
District School.....	398	318
High school.....	165	622
More than high school.....	10	847

Those who have gone beyond the high school make nearly three times as much as those who have gone to district school only. The $304 greater labor income made by the high school men is interest at 5 per cent. on $6,000. A high school education appears to be worth as much to a farmer as $6,000 in 5 per cent. bonds. If one has money he may get along without an education but for the poor boy, time spent in getting an education pays much better wages than could be earned in any other way.

Our farm management investigations have shown that in New York, it is not often possible to make a good profit in farming unless at least $5,000 is invested in the farm business. (For a discussion of methods of getting this information and definition of labor income, see Bulletin.)

TABLE 2.—RELATION OF CAPITAL TO LABOR INCOME (615 FARMS, TOMPKINS COUNTY).

Capital.	No. of farms.	Labor income.
		$
$2,000 or less	36	192
2,001 — 4,000 ..	200	240
4,001 — 6,000 ..	183	399
6,001 — 8,000 ..	94	530
8,001 — 10,000 ..	45	639
10,001 — 15,000 ..	44	870
Over $15,000	13	1,164

Amount of capital necessary. Table 2 shows the relation of the amount of capital to the wages made by the farmers in Tompkins County. Farmers with less than $5,000 received wages (labor incomes) of less than hired men receive. A hired man in this region gets about $360 per year. If a farmer gets less than this, he would be better off if he lent his money at 5 per cent. and hired out to a neighbor. Of 347 farmers with capitals of less than $4,001, not one made a labor income of $1,000.

RELATION OF CAPITAL TO PROFITS.

Capital.	Number of farmers.	Per cent. of the farmers making labor incomes of over $1,000.
$2,000 and less ..	66	0 %
2,001— $4,000 ..	283	0
4,001— 6,000 ..	265	7
6,001— 8,000 ..	127	13
8,001— 10,000 ..	59	20
10,001— 15,000 ..	53	30
Over 15,000	16	43

Among these men there are many able men—men of as great ability as we find in any business. Certainly the chances of making a large profit with so little capital are not very good. But with larger capitals, both the averages and the upper limits are better. Of the farmers with over $15,000 capital, 43 per cent. made labor incomes of over $1,000. They made interest on their investment and more than $90 per month for their time. A number of them made over $200 per month.

TABLE 4.—CAPITAL RELATED TO LABOR INCOME.

578 Farms, Livingston County.

Capital.	Number of farms.	Average labor income.
		$
$5,000 or less....	87	291
5,001 — 7,500..	80	407
7,501 — 10,000..	112	480
10,001 — 15,000..	164	769
15,001 — 20,000..	62	1,001
20,001 — 30,000..	55	1,062
Over $30,0000.....	18	1,691

The same points are shown in table 4 for Livingston County. The farmers with less than $5,000 are not doing as well as hired men. Those with larger capitals are doing well.

The same condition confronts us in all parts of the United States and Canada. Farming requires capital—much more capital than formerly. How may the young man hope to get started when he lacks this capital?

INTENSIVE FARMING NOT A REMEDY FOR SMALL CAPITAL. One of the popular suggestions is that he do intensive farming on a small area. The trouble with this is that such intensive enterprises nearly always require as much capital as is required with large areas and the usual types of farming. We have found a number of farmers who are making money on 10 to 20 acres of muck land but their capitals are large ones. One man with 20 acres made a labor income of $3,736, but his capital was $15,775, as much as some of his neighbors had on 200 acre farms. Another man made a labor income of $3,195 on a one-horse muck farm of 12 acres, but his capital was $6,850.

We frequently hear of a striking success on a small area, but these small areas nearly always have a large capital. They do not solve the problem for the young man with little money.

CHEAP LAND NOT A REMEDY FOR SMALL CAPITAL. Another popular idea particularly among city persons, is that cheap land will solve the problem because one with little money can get considerable land. I have no figures on the chances of starting on new land in Western Canada, but even there it is difficult to get a foothold without money. The land in eastern North America that is too cheap is a very expensive luxury. Some of our wealthy city friends are attracted by it. They buy such land in order to show farmers how to farm. Such land gives them a place on which to build a few cement hen houses and pig pens. Such persons think that farming is a process of raising buildings and see no obstacles on cheap land. But a farmer raises crops. Such land is not adapted to his uses. Sometimes land is cheap when it is really good, just as we may sometimes get a good horse for $20, but it is not often that our very cheap land is good for a man with small capital. The rich man may support such land, but it is not likely to support him.

TABLE 5.—VALUE PER ACRE RELATED TO PROFITS (TOMPKINS COUNTY).

Value per Acre.	Number of Farms.	Average Value per Acre.	Labor Income.
$20 or less	51	$16	$200
21 — 40	215	32	409
41 — 60	176	50	463
Over 60	69	91	344

Table 5 shows the relation of labor income to price of land in Tompkins County. This is a region of extremely variable soils. The cheap land does not give a reasonable profit. The good land that can at present be purchased at from $50 to $80 per acre is best.

TABLE 6.—RELATION OF SOIL TYPES TO PROFIT (TOMPKINS COUNTY).

Soil Type.	Number of Farmers.	Average Labor Income.
Volusia silt loam.....	65	$218
Volusia loam.....	116	425

Table 6 shows a comparison of two soil types; the silt loam is one of the poorest soils. There are large areas of it in New York, Pennsylvania and Ohio. The loam is a fairly good soil. The farmers on the poorer soil make wages of 70 cents per day while those on the better soil make nearly $1.40 per day.

I expected that with equal capital, the poorer soil would pay as well as the better one. This does not seem to be the case. When sorted by equal capitals as

TABLE 7.—RELATION OF SOIL TO PROFITS WHEN THE INVESTMENTS ARE EQUAL. (TOMPKINS COUNTY).

	Volusia Loam.		Volusia Silt Loam.	
Capital.	Number of Farms.	Labor Income.	Number of Farms.	Labor Income.
$2,000 or less	3	$203	8	$151
2,001—$4,000	40	256	26	137
4,001— 6,000	39	494	19	142
6,001— 8,000	25	527	6	106
Over 8,000	13	721	7	695
Average.....	.....	440	.....	246

in table 7 with every amount of capital, the better soils pay better. When comparing two distinct regions, the land may not be properly valued so that the cheaper land may be best, but in any small community, the good land is usually best for a man of small means. It takes capital as well as time to develop poor land. As a real estate speculation, cheap land is sometimes good.

THE FIRST START IN FARMING. For a farm boy without an agricultural college education, the best way to start is as a hired man. If the neighborhood is a prosperous one, that is the place to begin, if not, go where farmers are prosperous.

By working from two to five years, he may save enough money to become a tenant. If he has proved himself both worthy and efficient, he will have no difficulty in renting a good farm.

In whatever position one is working, he should strive to earn at least twice what he gets. Men do not buy cows, land or labor unless they expect to make a profit on them. If one gets all he earns, why should any man desire to hire him? When the salary is raised, it is not because the employer thinks that the increase will be earned, but because it has been earned. This holds true on farms, in shops, in universities, everywhere, one must always earn his increase in pay before he gets it.

A graduate of an agricultural college who has grown up on a farm can usually start best by teaching, in experiment station work, or as a farm manager. By taking the best position available, when experience, opportunity and salary are all considered, he should be able to save more in a year than the farm hand receives.

A position that calls for travel and study on farms is very desirable for one or two years. A place as farm manager on a real farm is good both because of the experience and the low expenses. Some of the best paying positions are as managers of estates. The experience gained on such places is often harmful. If any ideas are gained, they are likely to be extravagant notions that are adapted to spending money—not to making money.

The College graduate often skips the tenant stage. In such cases, the farm should be bought as soon as one has money enough to secure the place on contract or by part payment. The farm is then rented while one continues in his position. In this way a farm may be bought long before it could possibly be purchased if one were to attempt to equip and run it. The salary should usually pay the interest and some of the principal. The rent may be applied on the principal. Either the salary or rent should pay the interest. It is not likely that both will fail in the same year. If one were on the farm and had a crop failure, he might lose the place. When the farm is largely paid for, one may move onto it. This is the plan followed by nearly all the men who wish to farm and who are in experiment station and government work.

One great advantage of buying a farm as soon as possible is that it ties one to the land. A salaried position may wean one away from the farm. The farm also furnishes a place to spend vacations. It forces one to economize in his youth. There is a general tendency for land values to rise. If wisely chosen, the rise in value of the farm may be equal to the interest.

The first farm purchased need not be the one on which the final home is to be made. If it is a good investment, it may be sold and a larger and more desirable place may be purchased.

In choosing a farm, productive soil is the first consideration. It rarely pays to work a farm that is not located in a prosperous community.

Starting as a Tenant.

Table 8 shows that tenants who have less than $1,000 capital do not often make as much as hired men. Apparently one must have at least $1,000 before it will pay him to start as a tenant. With less than this it is not often possible to secure a good farm as the owner always desires a tenant with money and equipment so that he can work the place well.

TABLE 8.—RELATION OF TENANT'S CAPITAL TO TENANT'S LABOR INCOME.
134 Farms, Tompkins County.

Tenant's capital.	No. of farms.	Tenant's labor income.
		$
$ 500 or less	12	282
501— 1,000	45	309
1,001— 1,500	43	342
1,501— 2,000	15	356
2,001— 3,000	16	670
Over 3,000	3	880

Table 9 gives the same results for Livingston County. Apparently one ought to have at least $1,000 before he changes from hired man to tenant.

TABLE 9.—RELATION OF TENANT'S CAPITAL TO LABOR INCOME.
204 Farms, Livingston County.

Capital.	Number of farms.	Tenant's labor income.
		$
$1,000 or less.	20	368
1,001— 2,000	65	481
2,001— 3,000	54	610
3,001— 4,000	27	626
4,001— 5,000	16	869
5,001— 7,500	17	1,346
Over 7,500	5	1,273

Cash rent requires a little more capital than share rent but pays the tenant much better. The landlord takes less risk and gets less return with cash rent. The tenant takes more risk and makes more money.

TABLE 10.—RELATION OF SYSTEMS OF RENTAL TO TENANT'S LABOR INCOME.
144 Farms, Tompkins County.

Form of rental.	No. of farms.	Tenant's capital.	Tenant's labor income.
		$	$
Cash	29	1,584	604
Half of crops	6	1,177	467
Half of receipts	109	1,264	342

By comparing tables 2 and 3 with 8 and 9, it will be seen that while owners with less than $5,000 are not doing well, yet tenants who have $2,000 to $4,000 are doing very well indeed. It appears that it will not often pay a tenant to change to owner until he has or can borrow at least $5,000.

Farming as a part-owner. It was a great surprise to me to see how many farmers recognize that their farms are too small and so rent additional land. Table 11 shows that in Livingston County, over one-fifth of the farmers rent additional

TABLE 11.—OWNERS RENTING ADDITIONAL LAND.
374 Farms, Livingston County.

	Number of Farms.	Capital Owned.	Acres Owned.	Acres Rented.	Labor Income.
Owners operating their own farms only	292	$11,169	126	0	$575
Owners renting additional land.....	82	8,334	81	57	609

land. By enlarging their areas in this way, they are able to secure better labor incomes than their neighbors. If one buys a farm that is too small, he should rent additional land until he is able to buy it.

Types of farming with small capital. Table 12 shows the per cent. of the receipts derived from cash crops with various amounts of capital. The man with

TABLE 12.—RELATION OF CAPITAL TO TYPE OF FARMING.
578 Farms, Livingston County.

Capital.	Per Cent. of Receipts from Crops.
$5,000 or less	73
5,001— 7,500	68
7,501—10,000	65
10,001—15,000	65
15,001—20,000	55
Over 20,000	43

small capital finds it best to sell crops. As his money increases, he can profitably increase the animals kept.

But some farmers with each amount of capital have fed most of their crops and others have sold them. Table 13 shows that in Livingston County, the men with

TABLE 13.—SYSTEMS OF FARMING WITH DIFFERENT AMOUNTS OF CAPITAL RELATED TO LABOR INCOMES.

578 Farms, Livingston County.

Per Cent. of Receipts from Crops.	Labor Incomes on Farms with Capital as designated.			
	$5,000 or less.	$5,001 to 10,000.	$10,001 to 15,000	Over $15,000.
20% or less	$253	$227	$554	$1,000
21 — 40	181	280	587	1,399
41 — 70	256	555	707	1,038
71 — 90	424	436	834	1,194
Over 90	231	320	714	473

$5,000 or less capital who made the most derived 71 to 90 per cent. of their money from crops. But with over $15,000 of capital, the ones who derived only 21 to 40 per cent. of their money from crops made most.

When one is very short of capital, he should make very few long time investments. Planting orchards, putting in tile drain, raising colts, expensive cows, pure-bred stock, should not be taken up too quickly. All these may be the best possible things when money is available, but when the interest must be paid next fall, quick returns must be secured. Second hand machinery may be purchased, and the more expensive tools be hired. Paint is one of the last of the desirable investments.

Of the farmers in Tompkins County who operated their own farms and who had less than $3,000 capital, five made labor incomes of over $600, the highest was $794. Three of these worked additional land on shares. Of the farmers with $3,000 to $4,000, ten made labor incomes of over $600, the highest was $800. Potatoes, hay, and eggs were the chief sources of income on these farms. Dairying usually requires more capital. The cash crops that bring quick returns are the ones that have paid such persons best. A better way is to rent additional land.

It now takes longer for a hired man or a man on a salary to earn a farm than it used to, but the farm is now much more worth while. Any young man with health and energy can earn a farm. Probably he can earn it as soon as he could secure an equally desirable business in a city.

ELECTRICITY ON THE FARM.

Hon. Adam Beck, London, Ont.

To-night you have been kind enough to ask me to deal, in a short way, upon the question of electricity as applied to the farm, as we saw it on the continent of Europe, especially in Germany.

We have made some statements of a public nature in reference to this great question as we hope it will apply to the farms in the Province of Ontario. The broad principle of public owned electricity is almost ancient history I suppose to most of you. Yet it may be well that I should, in as short a time as possible, say a few words as to the bringing about of this great project and of the scheme as it has been adopted by the people of this country.

Electricity is of recent origin, we may say. It isn't many years old. That it has worked a revolution in many ways we all realize, both on the farm and, of course, from an industrial standpoint, to a very great extent. The farmer must be careful. The farmer must have felt that electricity was a great help to him when he first had the telegraph bring him the reports from the markets of the world, thus putting him in touch with the markets of the world in a very much shorter time than when he relied upon the post and the stage coach. Then electricity in the telephone has brought you still nearer the market. The tramways have brought your products closer to the markets of the world and of your own district. And now electricity is to operate the machinery of the farm to a greater extent, we believe, in a very great part of the Province of Ontario than steam power or animal power or manual labor has done in the past.

The great question is, how can we bring it to the people in cheap form, and what ways and means shall we adopt in bringing it to the people at the lowest possible cost? The lowest possible cost is to bring it through the waterfalls. The

great industries of our country felt the need of it and they are now getting it from our waterfalls at the lowest possible cost. The farm industry requires it to-day as much as any other industry, because of two facts—the scarcity of labor, and the high cost of labor. And we must make the farm more productive, farm life easier to bear, if we are to expect people to continue to live on the farm. To solve the problem we turn more especially to machinery, and machinery requires power.

Now, there are two sources of power—one is coal and the other water. We have waterpowers, but we are without coal. We, therefore, say we have "White coal," while this country is devoid of black coal. "White coal" is the cheapest way of developing electricity. But the great question was, can we bring that direct to the people without having the exploiting of large corporations, mergers, and trusts? Can we secure the waterfalls and develop electricity at a less cost to the people of the Province than electricity developed by steam, coal, peat or wood? We have in this part of the Province very cheap power available to the people. You may know that we have 100,000 horse power at Niagara Falls available at $9.00 per h.p. It is a very great asset. It is a perpetual power, in this sense, that while our silver mines become depleted, while our iron mines become depleted, and our gold mines become depleted, and while our coal mines and our forests will become depleted, the waterfalls need never depreciate in quantity or in value. So long as we reserve the rivers of the north, the present quantity of water flowing over Niagara Falls will go on for ever. So that we have a perpetual source of power from the waterfalls power of Ontario that we could never have from any other source of supply.

Then the question of conservation has been thoroughly considered, and certainly we must feel supported by the government of this country. The conserving of this great national asset for the use of the people is one of the fundamental principles of both political parties for all time to come in the Province of Ontario.

Now you know that a large amount of money has been expended by the Province in the carrying out and forwarding of this great scheme. Up to the present time over $4,000,000 has been expended in apparatus for converting of it, and the transmission of electricity for the use of the people of the Province of Ontario, and over 30 municipalities have made contracts and are being supplied with power through the government of the Province at cost.

What constitutes the cost of power, is a question you might naturally ask: the 4 per cent. interest on the moneys invested, a sinking fund to retire the debt in 30 years, the operating and administering of the whole project, and finally the line loss and the up-keep of the whole system. That is the cost of power. The price of power to the municipalities is annually adjusted. Every year as the consumption increases and the cost is reduced there is an adjustment, and if there is a surplus that amount goes either to the credit of the municipalities or they are reimbursed to that extent. So that no money goes to the treasury of the Province of Ontario other than the interest and sinking fund necessary to compensate the province and the ultimate payment back to the province, when the transmission system will belong to the people. There is no longer any debt upon the whole enterprise. It is an advanced project in the history of the continent of America at least, when a government undertakes a scheme for the benefit of the people from which they exact no profit or gain whatever.

Two hundred and eighty odd miles of high voltage tranmission line has been erected, over 180 miles of low voltage line has been erected, and then a hundred of miles in the municipalities. This has already been constructed and financed. Now, were you to take Niagara power and try to transmit it to the farmers or to an

individual, the cost would be prohibitive. It is only because of the large municipalities and the larger centres having undertaken the financial obligations of building these different high voltage and low voltage lines that the power will be available at an average price to the farmers in those districts.

The difficulties we have in comparing it with the continent of Europe is that our farmers are a greater distance apart, the mileage is longer than it is in the continent of Europe, which is thickly populated. Another disadvantage is that, to a large extent, on the continent of Europe the farmers live in villages. Their houses are grouped together in villages, and in the morning they go out to their farms and work, returning to the village in the evening. Consequently, they are easy of access with electricity, and the distances are short. They go out every morning on to the farms and cultivate till night-time and then they come back. But that makes it much cheaper as to the cost of distribution. But a great advantage over them is this fact, that we are supposed to use machinery to a larger extent than they do on the continent of Europe. We are supposed to use more machinery per man. And another reason is that farm labor is very much higher here and very much scarcer. Consequently, when you save labor you save about three times the amount that they do on the continent of Europe, where women are very largely employed, and are very largely underpaid. So those two factors are very important.

The purpose of the trip that I had the pleasure of making with some of the engineers under me in the Commission, was to study and see personally the uses that are made of electricity on the farms on the continent of Europe, particularly in Germany. Steam power took the place of the animal power and manual labor some years ago on the continent of Europe, and we had many statistics with us showing the enormous saving that steam power created in the operation of those farms. I have some facts and figures with me. We are at the present time compiling a very extensive report upon our trip to Europe. This will be published in book form and we hope to distribute that report through the agricultural department so that it will go directly to the farmer, so that he will at his own leisure study the report on the uses of electricity and as it is applied on the continent of Europe, especially in Germany. We have many figures—many reliable facts of information that I think will be valuable to the farmers in Canada. And I add, it is to our interest, it is our bounden duty, and it must be our purpose to stimulate the farm industry in this country, and incidentally when we do stimulate the industries of this country through this great project, we are indirectly stimulating farming, because we are creating a home market for the farmer, the most desirable market, to my mind, for any country that has mixed farming; where the farmer will have a market close at hand in the towns and villages that we are building up, where labor will be employed, where he can sell all the products of the farm and keep the by-products to increase the productiveness of that farm. If we do that we are accomplishing a great work in the interests of the farmers and other people of the Province of Ontario.

Now, I have here some data which shows what steam power did for farming in Prussia. The following figures show how the different agricultural machines affected the profits of the farm. Steam machinery on the farm, as classified here, increased the profit of that farm from $110 to $3,540. Now, that is one of the illustrations that we are setting forth in this report of our trip to Europe for the use of the farmers.

Then I have a table that gives the expenses connected with agriculture in the Kingdom of Prussia. It gives the taxes, up-keep, wages to hired help, and so on,

and the increased profit that he can make by the assistance of steam driven or electric driven machinery that the farmers can use, and the machinery that he can ply on the operation of his farm.

We have to-night some illustrations, some lantern slides, but before giving you the illustrations I might in a few words explain what you can do with the power made available to the farmers in the Province of Ontario, and what I would conceive to be the cost of the apparatus required and the cost of the power and the use that can be made of it. On one of those farms in Germany, a 53 acre farm, we found three motors in use at the farm and the barn yards, and the house well lighted by electricity. In this special district, which was about 40 or 50 miles from the city from which the supply came, there was an association formed by the farmers. They purchased the power the cheapest they could from a company operating in this town or city, they built the transmission lines and transformer stations necessary to supply a number of villages in which the farmers lived—a co-operative concern. They took stock in this undertaking and they fixed the price of power at about 7 cents per kilowat hour. Now, that was the price they thought was necessary to raise the money sufficient to defray cost of power purchased in the city, and the erection and up-keep of the transmission lines and transformer stations. That is not a very cheap price for power, considering what we can do in this country. But what we asked the farmers was: Are you satisfied? Can you do without it? And the answer was: "No." It would cost more to do the work without electricity. In Germany it is running the cream separator, churning the butter, threshing the grain, cutting the hay and straw, cutting the wood, pumping the water, running washing machines and doing cooking in a small way. One man had 20 odd milk cows, and a dairy; he made the very finest butter and got the highest market price for it, because of the cleanliness. He used a small motor and had a horse power that pumped water in the different buildings. Another had horse power which ran a cream separator, a churn, and the machine to roll the butter and make the pattern. Then he had one in the barn to saw the wood, thresh his grain, and so on. He had a threshing machine, a very small one, just large enough to do his own work, and on wet days when he couldn't do any other work, he would just go and thresh grain himself. He would put in 10 or 12 armfuls and then tend its operation. In this country the farmer doesn't value his labor. He imagines that his labor isn't worth anything, it is of no value. There the farmer doesn't feel that he has time to put his harness on the horses and put his horses in his wagon. There, the man never leaves his work, unless he goes to church on Sunday. He sees every hour of the day is of great value to his farm and to himself, and he saves his labor, and uses electricity in many ways.

Now, if the farmer in this country thinks that he can afford to pay for his electricity just for convenience he is wrong. No one can imagine that we can build lines through this country and have it for lighting purposes only, and have it at prices that it will be economical. But if the farmer can use this power alternately for everything that he does, for milking, separating, churning, chopping the grain, cutting the hay and wood, threshing, and so on, and also for lighting, he can have it and use it as they do on the continent of Europe.

You will say that $50 a horsepower is very expensive. If you can use $50 per h.p. per year and use it 10 hours a day, or we will say use 3 horse power on the farm 10 hours a day at $50, it will cost you 1.87 cents per kilowat hour. Now, we in the City of London, pride ourselves in having the cheapest electricity for household purposes on the continent of America, that is, 4½ cents. If you can use 3 h.p. for 10 hours a day on your farm it will cost you 1.87 cents per kilowat

hour. In Germany it costs 7 cents per kilowat hour. But you say: "We can use wood on the farm for cooking." Then electricity isn't as cheap. But suppose you have to buy coal.

There are certain fixed amounts which it will cost the farmer if you use it or not. The right of way will cost nothing, but then there is the line to wire, copper to supply, insulators, the poles, and the transformer station, they are built whether you use the power or not. Twenty-four hours a day the interest is accruing on that, and the up-keep is accruing on that. It isn't running machinery. Therefore, whether you use 1 or 2 or 3 h.p. all these fixed charges go on. Therefore, it is only actual power which will cost you extra. But if you can alternate the use of this power—in the early morning for lighting, then for cooking breakfast, then for milking the cows, then to separate the cream, then making your butter, then cut the roots for the cattle, cut hay and straw, in bringing in the hay and straw from the fields, carrying into the lofts through lifts, sawing wood, using the sewing machine, the washing machine, you will have very cheap light and power: but if you are going to pay $150 a year just to light your premises, of course, it will be a great extravagance. If that $150 a year will do all the things that I have outlined to you, and thresh your grain, clean your grain, and chop your grain, corn, and pump your liquid manure, rake your land, all those things, then electricity is cheap power, because you need one man less on the farm in order to much more than pay for it.

The method as it will be carried on by the Commission is this: A number of farmers in a Township petition that Township for a supply of power. They give the name of the farmer, the concession, and lot number, and the quantity of power he is likely to use in light and power respectively. That petition is sent to the Commission, the Commission give an estimate to the Council, the Council have a special session, the farmers meet the Council, receive the estimates, and the question then is: Will you become contracting parties for electricity? Then I will say the Township shall, if the farmer purposes contracting for it, and the Commission concurs, because the Commission will not enter into a contract unless they know it is going to be of value to the farmer who makes the contract. We are the guardians. We must become responsible. We are not vendors of power. We are not in the power business. We are simply trustees to safeguard the interests of the power business as well as the interests of the farmer, and all others who have use for power. I think, then, the township should undertake to dispose of the power to the farmers, and we make it easy for the Township in this way. We will take the city of Guelph. The town of Acton purposes voting on a by-law, Rockwood has already voted, Brampton has already a supply of power. Now, we would build a line from Guelph through the College, on to Rockwood, on to Acton, connecting at either Georgetown or at Acton with the Port Credit station. From that line we could step it down to 2,200 volts, and feed a strip eight miles wide; the farmers in that country can be supplied with electricity power to great advantage. Then we have a line from the city of Berlin to the village of New Hamburg. We have these lines over 180 miles, and as the territory is covered with these field lines all the farmers can be supplied with electric power. We purpose, as a Commission, stepping it down to 2,200 volts, then we expect the Township to step it down to 220 volts; that is about all the Township has to do. The investment, therefore, on the part of the Township is a very light one. The apparatus, which is the first cost, is supplied through the Commission, and it is bought at wholesale cost, because all this apparatus is bought in very large quantities by tender. We take the best apparatus we can get in large quantities at the lowest price. You are buying it at the same prices as the largest city will buy it at, so in that way you are immensely benefited.

Then the engineers are at your service. It would be impossible for any one municipality to engage the services of a first-class engineer, an expert in that work, even a large city could not do it, but the Province of Ontario can do it, and that expert engineering is available to you, as is also the system of accounting. We have expert accountants. All these things are available to you. Now, if you were obliged to do as they were in the Old Land, form yourselves into associations, undertake the whole liability, and finance it, it would be a different proposition entirely. You would have to engage engineers, have to pay a whole lot of money out to secure information—for it is necessary to gather a good deal of information to successfully work out a scheme of this kind. That responsibility is all taken off your shoulders by the Hydro-Electric Commission, so that you will be on an equal footing with the larger cities who can buy in large quantities.

I think that is about all I can say to you in connection with this matter, other than to explain the illustrations that show what they are doing in the Old Country. But do not imagine that every farm can get electricity at once. It will take some years to work it out, but the matter of supplying the farmer will become quite feasible. We have got to become educated. You have got to learn, instruct yourselves in the use of machinery.

I will give you an instances. At Ingersoll, we have a Mr. Krause who has two farms; one silo he was obliged to fill with a steam engine and one cutter; the other he filled with a portable motor put upon an ordinary lumber wagon. The engine and the whole equipment to run it cost $20 a day, as well as the labor used. At any rate it cost him $35 or $40. He used 19 cwt. of coal and a half cord of wood, and boarded the men, and so on. But supposing it was $25.00, it is cheaper to fill his silos by electricity than by steam. Then there is no danger from fire. There is a small capital investment necessary, but no labor necessary.

With these lines built by the Commission through the country, there is 2,200 volts available. Then you have to step it down to 550 volts. A flexible cable runs from the road to the barn. There is a portable motor set in the wagon, which you can wheel anywhere you like, and it costs—the whole equipment suitable for threshing—$800. A threshing outfit costs $2,000 or $2,500. When you want to run your machinery you throw over a lever and it runs itself. There is nothing required except the oiling of that motor once a month, maybe not once in two months. It requires no expert to run a motor, anybody can do it with a few days of teaching, so the simplicity and cheapness of it more than compares with the operation of a steam plant. You could have an association that would own a number of motors or some one individual may own them, or the Township may own them.

FORTY-THIRD ANNUAL REPORT

OF THE

Fruit Growers' Association

OF

ONTARIO

1911

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO)

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty
1912

Printed by
WILLIAM BRIGGS,
29-37 Richmond Street West,
TORONTO.

To the Honourable COL. SIR JOHN MORISON GIBSON, K.C.M.G., etc., etc., etc.,

Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

I have the honour to present the Forty-third Annual Report of the Fruit Growers' Association of Ontario.

Respectfully submitted,

JAMES S. DUFF,

Minister of Agriculture.

DEPARTMENT OF AGRICULTURE,

TORONTO, 1912.

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Fruit Growers' Association of Ontario.

OFFICERS FOR 1912:

President ..... D. JOHNSON, Forest.
Vice-President ..... J. W. SMITH, Winona.
Secretary-Treasurer ..... P. W. HODGETTS, Parliament Buildings, Toronto.

DIRECTORS:

Division No. 1.—WM. ALFORD, Ottawa.
" 2.—C. W. BEAVEN, Prescott.
" 3.—W. H. DEMPSEY, Trenton.
" 4.—WM. STAINTON, Oshawa.
" 5.—W. J. BRAGG, Bowmanville.
" 6.—L. A. HAMILTON, Lorne Park.
" 7.—J. W. SMITH, Winona.
" 8.—A. ONSLOW, Niagara-on-the-Lake.
" 9.—JOS. GILBERTSON, Simcoe.
" 10.—D. JOHNSON, Forest.
" 11.—R. R. SLOAN, Porter's Hill.
" 12.—F. M. LEWIS, Burford.
" 13.—ADAM BROWN, Owen Sound.

Ontario Agricultural College: Prof. J. W. CROW.
Auditor: D. F. CASHMAN, Parliament Buildings, Toronto.

REPRESENTATIVES TO FAIR BOARDS AND CONVENTIONS:

Canadian National: ROBT. THOMPSON, St. Catharines.
London: D. JOHNSON, Forest; C. W. GURNEY, Paris.
Ottawa: R. B. WHYTE, Ottawa; HAROLD JONES, Maitland.
Ontario Horticultural Exhibition: ROBT. THOMPSON, St. Catharines; J. E. JOHNSON, Simcoe; ELMER LICK, Oshawa; P. W. HODGETTS, Toronto.

COMMITTEES:

Transportation: A. ONSLOW, Niagara; L. A. HAMILTON, Lorne Park; GEO. FRENCH, Sarnia.

Co-operation: J. E. JOHNSON, Simcoe; ELMER LICK, Oshawa; ROBT. THOMPSON, St. Catharines; ADAM BROWN, Owen Sound; D. JOHNSON, Forest.

New Fruits: Prof. H. L. HUTT, Guelph; W. T. MACOUN, Ottawa; J. W. CROW, Guelph; A. D. HARKNESS, Jordan Harbor, and A. J. LOGSDAIL, Ottawa.

Historical: A. MCNEILL, Ottawa; L. WOOLVERTON, Grimsby; HAROLD JONES, Maitland; W. T. MACOUN, Ottawa; W. DEMPSEY, Trenton; R. B. WHYTE, Ottawa.

TREASURER'S REPORT, 1911.

RECEIPTS.

Balance on hand, December 31, 1910	$1,519 33
Members' fees	355 10
FRUIT SHOW:	
Sale of fruit	457 09
Entry fees	129 45
Legislative grant	1,700 00
Interest	38 90
Miscellaneous	2 38
Total	$4,202 25

EXPENDITURES.

FRUIT SHOW:	
Grants—A. P. McVannel, $21.50; S. E. Todd, $50.00; W. H. Gibson, $50.00; F. M. Clement, $50.00	$171 50
Labor—As per E. T. Reed's statement	47 00
Transportation—Dominion Transport Co., $3.64; G.T.R., $40.80; Canadian Northern, $47.93; Shedden Forwarding Co., $7.92; S. McIlroy, $16.50; Canadian Express Co., $58.27; Cuneo Fruit Co., $25.00; Dawson & Elliott, $10.43; F. W. Dawson, $1.45; J. H. Hurd, $6.25; D. Muir, $3.15; Manning Cold Storage, $176.86; Norfolk F. G. A., $35.58	433 78
Printing—Wm. Briggs	9 25
Judges' Expenses	10 00
Special Tickets	34 80
Incidentals—City of Toronto, $5.25; E. T. Reed, $14.32; Russill Hardware Co., $2.95; Firstbrook Box Co., $5.00	27 52
ANNUAL MEETING:	
Lecturers' Expenses—Prof. Blair, $25.00; N. E. Jack, $25.15	$50 15
Delegates' Expenses (1910)—W. J. Seymour, $4.50; Chas. Jackson, $6.65; St. Catharines, $16.95; 1911, Jas. E. Johnson, $47.75; A. W. Peart, $1.85; H. Jones, $8.20	85 90
Reporting—1910, $85.00; 1911, $85.00, Geo. Angus	170 00
Advertising—*Weekly Fruit Grower*, 1910, $4.50; 1911, *Weekly Sun*, $5.60; *Farmers' Advocate*, $14.00; *Farm and Dairy*, $3.92; *Canadian Farm*, $4.20; McLean Pub. Co., $15.00; Wilson Pub. Co., $32.00; *Weekly Fruit Grower*, $8.00	87 22
Printing	30 00
Rent of hall, etc.	34 40
COMMITTEES:	
D. Johnson, $41.90; Jas. E. Johnson, $27.40; F. M. Lewis, $11.25; H. Jones, $19.90; Jos. Gilbertson, $8.75; Wm. Alford, $15.00; A. W. Peart, $2.10; R. W. Grierson, $4.90; W. H. Stainton, $2.70; W. H. Bunting, $19.35	153 25
PRINTING:	
Bryant Press, letterheads (Directors), envelopes, $42.00; J. Frank Osborne, large and small envelopes and stationery, $71.65	113 65
PERIODICALS:	
Horticultural Pub. Co.	607 80
POSTAGE:	
Mrs. Hubertus, stamps	50 00
GRANT:	
J. W. CROW (for fruit packing school)	100 00
MISCELLANEOUS:	
N. R. Butcher, copy express judgment, R. R. Commission, $3.00; Exchange, $1.40; Dominion of Canada Guarantee Co., $10.00; Miss McMaster, $15.00, postcards; E. D. Smith, fee, $10.00; G. C. Gripton, stamp, $1.50	40 90
Balance on hand December 31, 1911	1,945 13
Total	$4,202 25

Fruit Growers' Association of Ontario.

ANNUAL MEETING.

The fifty-second annual meeting of the Fruit Growers' Association of Ontario was held in the Canadian Foresters' Hall, 22 College Street, Toronto, on the 15th and 16th of November, 1911.

Mr. D. Johnson, Forest, the President, called the meeting to order at 10 a.m. Wednesday, November 15th.

PRESIDENT'S ADDRESS.

D. Johnson, Forest.

Once again the Ontario Fruit Growers' Association of Ontario have met in Convention to discuss subjects of weighty interest to the industry in which we are engaged. The progress that has been made in fruit growing in the Province of Ontario is due largely to the early members of this Association, who in years gone by worked out as best they could the problems and obstacles that confronted them.

The changes that have taken place since then have been wide and varied and need not be mentioned now. The opening up of new markets such as Great Britain and Western Canada were in those days, I have no doubt, beyond their widest imagination. The lack of proper transportation facilities and consuming markets, I have no doubt, caused the early members of this Association to conclude that in the near future they would have supplied the demand, and that over-production would cause the profits to disappear. The fear of over-production has haunted the minds of many, as far back as I can remember, and, I believe, as far back as the oldest one present here can remember, the future has been more or less clouded by the fear of over-production.

Take apples, for instance. Let us look back to the first days of this Association, over fifty years ago. At that time some of the early members had small orchards of a few acres, the fruit of which they sold to their neighbours by the bushel, at prices that would not for a moment be considered to-day. They were alive to the fact at that time that they had in their little orchard a profitable thing, but they were sure that their profits would disappear with the plantings of their neighbors and their little circle of customers would vanish away. What have been the results? Almost without knowing it the circle of trade has widended, the planting has increased, till thousands of acres of orchard adorn the Province in which millions of dollars are invested and tens of thousands of people are engaged.

The circle of trade has passed the neighbors, the surrounding towns, far beyond the limits of our Province, until our fruit has found its place in almost every quarter of the globe, and, instead of peddling our apples by the bushel, we are selling in car and train load lots, at prices far in advance of fifty years ago.

It is true that the planting of orchards is going forward at a tremendous rate in Ontario. Scientific care is being applied, and I believe that the Province is on the threshold of a great awakening, and that in the next two or three years we will be producing twice as much fruit as we are now. The reason of this is due to the fact that in almost every part of the Province individuals have been taking an interest in their orchards, and have been receiving handsome returns for their time, labour and knowledge expended, with the result that these practical demonstrations have caused others to exert themselves in the same direction, until so many have succeeded that the people there become enthusiastic and take up fruit growing with a vim that assures distinction for that particular district.

In practically every part of the Province the awakening in fruit growing can be traced back to Government demonstrations or the work of some private individual who has in a greater or less degree allowed his light to shine among his neighbors. Such efforts cannot be too much encouraged, whether it be individuals, co-operative associations or Government demonstrations.

In view of these facts, why should we fear to push on increasing our plantations? It seems to me we are but playing on the threshold of our possibilities, and that the demand will increase with the production. We have in our own Western Provinces the best markets in the world. We rejoice in their success. As a farming community they can produce certain lines of farm produce to much greater advantage than we can, but fruit is beyond their control. The near future will, no doubt, see millions of prosperous people living on the fertile plains of the West and North, who will readily pay the price for all the fruit that we can produce.

It is gratifying to notice that fruit growing in Ontario is no longer confined to the farmer, who has other interests on his farm which take the greater part of his attention, but the formerly neglected orchard is, in many cases, considered by far the most valuable part of his farm. Capitalists are also being attracted by the handsome profits and are taking it up with an enthusiasm that assures success. The Eastern Counties along Lake Ontario and certain parts of the St. Lawrence district are making wonderful progress in apple growing. Hundreds of thousands of trees have been planted during the last few years, and the necessary care in cultivation, spraying, pruning and fertilizing are being given to a much greater degree than formerly. In the Georgian Bay district, a great revival in the care of orchards has taken place, and while the planting is not so great as in some other sections, yet the output is fast increasing, owing to scientific treatment given the formerly neglected orchards. In the Southern part of the Province, especially Norfolk, great activity exists, and, under the able leadership of the Norfolk Fruit Growers' Association, whose affairs are guided by one of the ablest men the fruit industry of Ontario has ever known, has attracted attention and drawn to themselves wide distinction.

The Niagara district still holds the banner as a tender fruit growing district, their enormous production is the result of their energy and the success attained is a standing memorial to the ability of former members of this Association, as well as to many who are here to-day.

Up in Lambton County, along the south shore of Lake Huron, we are trying to follow in their footsteps, and are laying the foundation of a fruit district that we believe is unsurpassed by any other in the Province. During the past season nearly 100,000 trees, principally peaches and apples, have been planted, with every assurance of success. The planting of next spring promises to surpass that of last

spring, and the care which they are giving these young orchards, together with the restoration of old orchards, promise great things for the future.

I am fully convinced that peach growing in North Lambton is bound to be a success. It has long ago passed the experimental stage, as for over fifty years small orchards have thrived, with but little care. We are in exactly the same latitude as St. Catharines, and have to the north and west of us the moderating effects of Lake Huron, just as they have Lake Ontario to the North of them. Root killing up there has never been known, and up to the present, as far as the most careful investigation will reveal, we are absolutely free from the San Jose Scale, Little Peach, or Yellows.

It is gratifying to know that spraying has become a recognized necessity among the fruit growers of this Province, as, during the past season, I believe fully 100 per cent. more spraying has been done in Ontario than any previous year. The advantages of spraying are so apparent as to need no further comment, although I believe there is much yet to be learned about the action of Lime-Sulphur and Arsenate of Lead, under various climatic conditions.

A new departure has come prominently before us during the season that is past, it being the leasing of neglected orchards by capitalists. Thousands of acres of orchard have been taken over by these companies, and in many cases are being given the best of care. This is being looked upon by some with a certain amount of suspicion and doubt of its success. Personally, I can only look upon it with favor, as we cannot deny the fact that most of these orchards were anything but a credit to their owners and would, no doubt, have continued so had they not been taken over by others who will give the required care.

What we want in this Province is more specializing in fruit and not the half-hearted, haphazard methods employed by many of the farmers of Ontario. If the leasing of orchards is properly carried out there is no reason why it should not give a handsome profit to the leasee, while the orchard is being improved and in time returns to the owner greatly increased value. I have had some little experience in this myself, and have always found it a most profitable investment.

Every branch of fruit growing in Ontario is prospering to a degree never known before, a display of which is to be seen at the Ontario Horticultural Exhibition, in the St. Lawrence Arena of this city. The display of fruit there reflects great credit, not only on the fruit growers of Ontario, but on the officials of that show and particularly on our worthy secretary, who has always been unwearied in his efforts to promote the fruit growing industry of the Province.

In view of this development throughout the Province, is it not opportune for us to ask ourselves what is the Government of Canada doing to develop the industry that we all have at heart? We rejoice to know that in the new Government at Ottawa we have, in what I believe the most important place in the Cabinet, a fellow fruit grower as Minister of Agriculture. The Honorable Mr. Burrell is no stranger to the fruit growers of Ontario, as the progressive energy that he has displayed in his orchards in British Columbia has won for him a high place in the estimation of Canadian fruit growers. We now look to him with confidence to carry out many reforms that we would like to see brought about.

I believe I voice the desire of the greater part of the fruit growers and shippers of Ontario when I say that we want the Inspection and Sales Act so changed as to give us inspection at point of shipment, and that there inspection shall be final. Personally, I have always been well used by the Fruit Division, and therefore have

no personal complaint to make: but, nevertheless, I wish to place myself on record as being absolutely opposed to the present administration of the Inspection and Sales Act.

The worthy Chief of the Fruit Division and many of the Inspectors have been unwearied in their efforts to promote the fruit-growing industry, but, owing to the present system, they have not met with the success that we would like. I hope this Association will put through strong resolutions, and that, if necessary, these resolutions be carried to Ottawa by a strong deputation, asking that we be given inspection at the point of shipment and that inspection there shall be final.

That the appointment of fruit inspectors be taken outside of political rewards.

That no inspectors be appointed but thoroughly qualified men, who have served at least one season as foreman of packers.

That inspectors be appointed by a commission to be composed of men known for their experience and knowledge of the fruit business, and not for their political activity; also, that all inspectors should have uniformity of judgment, which I believe can only be attained by their graduating from some school of packing such as the Short Course in Packing at the Ontario Agricultural College, and that they receive therefrom a certificate before they be considered by the Commission of Appointment.

This may seem like a lot of red tape, but when we remember the fact that an inspector can largely make or break the reputation of any shipper, we cannot be too careful in their selection.

Up to the present we are, I fear, very much at sea regarding the minimum size of leading varieties of apples and I would suggest that a committee, composed of well-known apple packers be appointed to consider the question and try and arrive at a definite conclusion.

We are looking forward to the proposed Dominion Conference of Fruit Growers, to be held at Ottawa this winter, when we hope that much will be accomplished that will tend to the advancement of the fruit growing industry. A session of this Convention will be devoted to subjects to be discussed at that time, and I trust that each subject will receive the consideration that it deserves.

I would also like to see a resolution from this Association asking that the Canadian Government instruct their trade agents in British markets to cable, daily, the average price realized from sales of Ontario fruit and the conditions of the market in the leading cities of that country. Those of us who have had experience in shipping to those markets know that the information that we now receive is not always what we desire.

Then, again, there is the question of a Fruit Commissioner in the Department of Agriculture at Ottawa, instead of having that Department under the control of the Dairy Commissioner. Surely the fruit industry has reached such proportions that we should have a Commissioner of our own, and, as the present Government has often urged such an appointment when in opposition, we naturally expect them to carry out their promises now. I would also like to see legislation enacted regarding the control of insect pests and diseases of the tree, that would provide Provincial inspectors instead of local inspectors. This will, no doubt, come up later in our proceedings, and I trust will be given the attention it deserves.

In conclusion, let me thank you for the honor you have conferred upon me in selecting me as your President, a distinction which I know I do not deserve, but one that I appreciate very much indeed.

MR. HODGETTS: One thing has been mentioned that I think you would like to discuss, and that is the matter of determining the standard sizes of apples. There was a committee appointed a year ago when this suggestion was made. Mr. Winslow, of British Columbia, claimed that in some varieties their apples were so much larger than ours that it was almost impossible to have a standard size fixed. The other Provinces, however, were all willing, but it was owing to the opposition of the British Columbia delegates that the Minister, when we were before him, allowed the matter to drop for the time being.

THE CHAIRMAN: I think British Columbia is opposed to a minimum sized apple.

MR. JOHNSON (Simcoe): I would agree to Ontario having a definite sized apple, that is, for each variety. Take varieties such as the Northern Spy and the King and give them a size that will be standard, and the Baldwins will have another size and the Russets another size. I think it would be well to have these sizes defined, and I think it would also work out to the satisfaction of all the Provinces, Nova Scotia as well.

MR. THOMPSON (St. Catharines): If it could be worked out as Mr. Johnson says by taking the different varieties of apples and giving a standard size to each one, that would be all right. Let each one be a certain size all the way through.

THE CHAIRMAN: That won't work.

MR. THOMPSON: If we could take the small-sized apples it would be quite a help, because at the present time quite a number of packers do not really understand what is the size for No. 1: they think they can call the apple No. 1, no matter what the size is. I think it would be practicable; I cannot see any reason why it should not be.

THE PRESIDENT: I think every packer in Ontario has a standard before him. It is a serious thing, and he ought to understand what is the proper size of all apples.

MR. E. D. SMITH (Winona): I remember some time ago, when the committee of this association was formed, that the matter was discussed then, and it was thought it was undertaking rather too much at the beginning, that it would be necessary to move step by step, but they agreed that it would be a very desirable thing when the proper time came. They were under the impression that the people of this country were interested in the apple industry, and for their sakes, as well as our own, I think that the time has come when we can with propriety ask the Government to define the proper sizes of the chief varieties of apples. I should think that a committee of this Association ought to fix this, and have it ready to present at Ottawa. Not only the Growers' Association but the Apple Shippers' Association should be conferred with. It is a matter of considerable moment and interest to them as to what these sizes are to be, and I quite agree that the time has come to take this matter up.

A MEMBER: I am from Montreal, and we have large quantities of apples from the Maritime Provinces, and their barrels hold about a peck less than our standard barrels. We are using the standard barrel, but they have a smaller barrel. They look more like wine barrels than apple barrels. We have to meet this competition, and we have some difficulty in doing so, as they can undersell us on account of the smaller size of their barrel. I think there should be a law fixing the one size for the whole Dominion.

THE PRESIDENT: What would you say ought to be the standard size for the whole Dominion?

A MEMBER: Why should they be privileged to use a smaller barrel than we do?

THE PRESIDENT: Their barrel is what is known as the Nova Scotia barrel.

MR. E. D SMITH: Their barrel is the legal barrel; ours is larger than the law requires, but our people have stuck to it. It holds about a peck more but is known all over as the Canadian barrel, and we get more for it. We get more money for that peck of apples than we do for any other peck in the barrel. The extra price that it sells for is more than the value of the extra peck that is in it, for it is recognized as the big barrel. All the same, the Nova Scotia barrel is the legal standard. Of course any one can make the barrel he uses as much bigger as he likes, but I would like to see a uniform barrel for the whole Dominion.

THE PRESIDENT: I remember that this question was very thoroughly discussed at the Dominion Convention at Ottawa some years ago; what we are speaking about now, however, is the minimum size of apples, not about the barrels.

How would it do to take a vote on this suggestion; those who are in favour of a standard size for the apples to be packed in the Province of Ontario please raise their hands. (Hands raised.) I think on that show of hands the suggestion is approved.

MR. E. D. SMITH: I would like to bring up a very important matter that has been referred to, but has never been carried out, and that is the matter of final inspection at the point of shipment. It has been a burning question between the Growers' Association and the officers of the Government for a number of years. The late Minister of Agriculture contended that it was too costly to have apples inspected at the point of shipment. I have always contended that it should be done regardless of the cost and that that inspection should be made at the request of anyone wanting it, and that no one wanting it should be entitled to it in regard to a smaller quantity than a carload lot. It is not intended that it should take the place of the present inspection. So far as smaller lots are concerned they could be inspected as they are now, but in addition to that, when any shipper has a carload of apples he should be able to obtain the services of a Government inspector, and he should inspect them sufficiently thoroughly so that he can reasonably stamp them as having been examined and as being of a certain standard. The objection has been made that you cannot possibly put the Government stamp on a car of apples unless you examine every barrel. The Government stamp on it would not bind anyone; he would inspect every tenth or twentieth barrel whatever the committee of experts would deem essential to test the quality of the apples, and then the inspector would stamp these barrels that were examined and give a certificate to the shipper that a certain car of apples at a certain place on a certain date were duly examined by the Government inspector and that he passed them as so and so. On the strength of that certificate that man could sell that car of apples in England or anywhere else if the lot were guaranteed by the Government stamp; it would give him a standard to go by. If that sale were made, and the consignee received the car of apples he could not refuse it on the ground that it was not properly packed; they might show that some of the other barrels that were not examined were not up to the mark, but the seller could say that it has been inspected by the Government inspector and has been passed, and on the strength of that you must take those apples and pay for them according to your contract. He could not crawl out of his bargain, because he found an odd barrel or two a

little bit off. For that service I have always held that it would be fair and reasonable that the shipper pay $5 a car or 5 cents a barrel, or something like that, which would in a large measure cover the expense of the inspection.

It has been pointed out that to examine somewhere in the neighbourhood of two million barrels in this country in a year would be an almost impossible task. But there would only be a tenth or a fifth of that, for these are in carloads. In sending a car of apples to a commission market it is sold on its merits, it is not sold on inspection. I do not think that this would affect more than one-third of the apples in the Dominion, and it seems to me that it would increase the facilities for the sale of apples a great deal. At the present time we can scarcely sell a carload of apples in England; they want to see them. I believe that every barrel could be sold and would be sold if there were a definite standard to which the purchaser in England would know whether the apples we proposed to ship were what he wanted or not. If you sent a car to England sold on a standard and an inspection there could not be any possible equivocation about it; the sale could be made just as easy as the sale of a car of wheat or any other commodity. Our present inspection is valuable and good as far as it goes, but I have always contended that we ought to go a step further. I think it would be only fair that at least half of the cost of this extra inspection should be defrayed by the shipper, and I do not think it would be found to be very heavy.

THE PRESIDENT: I entirely endorse what Mr. Smith has said. I have thought over this matter a great deal, and I think he is right.

A MEMBER: If you will listen to a man who is not a fruit grower, but who has spent a large amount of time in connection with fruit industry in California and elsewhere, I would like to say that I am very much pleased as a Canadian with this movement. I think it is a splendid idea. For the last twelve years I have been buying apples, and they have to come from Ontario, and this point under discussion has often arisen. I go down to the market and I see a sample of apples that suits me, and I say, "Can you give me five or six carloads guaranteed to be the same quality and size as the sample," but they will not give any guarantee. You have to judge by the looks. That is a splendid idea. That is the idea that is carried on in British Columbia. These packages from there that I have seen apparently have been selected with the utmost care, and it is a delight to look at them and see how they are put up, and the care and pains the packers are taking to meet the demands of the public. I say that years ago in California I watched the people there, and I was amazed to see so much time spent over their apples. I was brought up on a farm where we used to pick them up and throw them all into the cellar in the most careless way, but I am glad to say that I find on coming back that things have developed in Ontario in this respect. I thoroughly believe that if some such plan were carried out that you would derive great benefit from it.

MR. L. A. HAMILTON: My neighbour came to me the other day. He is a large apple grower in the County of Peel, and he told me that he had sold his apples in the orchard. I told him I thought that was a rather dangerous way on account of the culls, but he told me that he had got that all fixed for. Said he: "My arrangement with the packer is that there are not going to be more than ten per cent. culls." (Laughter.) I found that that trick is being done all over our vicinity, a fixed amount of culls; it is likely to mean that the apples are poorer, for a man is bound not to make more than that amount of culls. I know his apples, and they are not any better than mine; but I am satisfied that I could not pack

my apples properly and make any less than 33⅓ per cent. of culls; not so much on account of worms and scab, but the question of size is the great trouble. I have a lot of beautiful Spies, but I have had to stop shipping barrel after barrel. I have packed a lot of No. 2 apples, but I am really afraid to put them on the market lest I should be called down by some inspector. There is the difficulty I am confronted with. It is impossible for me to say that these apples come up to the size that the inspector may think they ought to come up to or not. I believe there ought to be some system by which these professional apple packers should have a lesson. I do not suppose you could apply it to the individual apple grower. These apples should be marked according to some standard size, and if there was some system producing uniformity in packing it would be a good thing. I believe if this were the case there would be a large increase in the apple trade all over, and personally I would be very willing to pay my share of the cost of the man coming to make inspections for me. I should have been delighted, indeed, to have paid the expenses of some Government official or other who would come and show me where I was not packing these apples according to the statute. I may be figuring in the police court, and may be fined $40 or $50 quite unwittingly. There is no question affecting the vital interests of the apple growers of Ontario as this question does. And now that we have an apple grower at the head of one of the most important departments of the Government service, I do not believe that we can urge too strongly that he should fix that statute so that we will definitely know what is a No. 1 apple and what is a No. 2 apple as regards size.

THE PRESIDENT: I am very glad to hear you express yourself in that way. We should certainly have a larger number of inspectors. We should have enough to see that there is no more of this arrangement you spoke of, for a fixed amount of culls. Then if they give the instruction, and there are those who will not learn, they will have to feel the application of the law.

A MEMBER: I can't agree with what has been said about the apples in the west. These packers who have agreed to ten per cent. can put them up as one, two or three. The trouble is that some of the merchants in the west have bought some that are right and some that are not right. Then they show him the ones that are right and they work these others in. The Ontario grower does not pack them in that way, and if in 50 or 100 packages there is one that is not according to the standard it is an injury to all the others. We want more inspectors so as to protect the 99 per cent. who are putting their goods up all right. I have seen apples from British Columbia passed as No. 1 which are not correct. We would hardly call them cider apples, and that does not carry out what our friend said.

A MEMBER: May I qualify my remark in this way: I would not guarantee from what I have observed that all the fruit that was well packed was properly marked; but that there was a large proportion that was beautifully packed, and the apples were all the same size.

COMMITTEES.

The following Committees were then appointed:

RESOLUTIONS: Messrs. L. A. HAMILTON, Lorne Park; J. E. JOHNSON, Simcoe, and R. W. GRIERSON, Oshawa, appointed by the Chairman, and Messrs. W. C. MCAINSH, J. L. HILBORN and E. D. SMITH, elected by the convention.

NOMINATIONS: Messrs. R. B. WHYTE, Ottawa; R. R. SLOAN, Porter's Hill; and A. ONSLOW, Niagara, appointed by the Chairman, and Messrs. ROBERT THOMPSON, St. Catharines; C. H. FISHER, Queenston; and ADAM BROWN, Owen Sound, appointed by the Convention.

REPORT ON NEW FRUITS.

W. T. MACOUN, DOMINION HORTICULTURIST, OTTAWA.

The number of new fruits of merit which are introduced each year is quite small. This is fortunate, in that fruit growers are not tempted to grow a large number of varieties. Many of them grow too many already without undue temptation. The time is coming, however, when there will be many new fruits of merit available for introduction, and there should be some plan worked out whereby the grower will be kept from planting any large number of trees or plants of a variety which has not been strongly recommended by some institution or society. The practice of co-operative societies buying fruit trees for their members is a good one, as in this way the number of varieties grown in a district is limited, and only those most suitable for the district are planted.

The reason why a large number of varieties of merit will soon be available for introduction as that up to within quite recent years the development of new sorts by the Experiment Stations has been carried on in a very small way, and few things worthy of being grown in the best fruit districts have been originated. All this is changed, however, and fruit breeding is now an important part of the work of the Horticultural Department of a large proportion of the fifty odd Experiment Stations in the United States, and Canada also is doing, if not her share, at least doing something. Two States which are breeding fruits on a large scale are South Dakota and Minnesota. From South Dakota a number of new fruits have already been sent out and the Minnesota State Breeding Station, though organized but a few years ago, has originated some good things already. The New York Experiment Station is beginning to distribute new fruits, and has already sent out some new apples, raspberries, and strawberries.

The standard varieties we have to-day are almost all of them chance seedlings from the thousands of seedlings which have sprung in America and Europe during the past one hundred years or more, and it is scarcely to be expected that anything as good will be obtained from the limited number grown by comparatively few institutions and individuals for the especial purpose of obtaining new varieties.

Apples: The only really promising apple which has been received by your Committee during the past year is the Norfolk Beauty, sent in by Mr. J. E. Johnson, of Simcoe, Ont. In brief, this is somewhat like a very highly colored Tompkins King. The name Norfolk Beauty had already been taken for another variety, but so far as we know a description had not been published.

530. Norfolk Beauty (Strawberry King).—Large; roundish, ribbed; cavity open, shallow to medium, russeted; stem short, stout; basin medium to deep, medium width, wrinkled; calyx closed or party closed; color yellow, well washed and splashed with deep orange-red to dark red; predominant color deep orange-red to dark red; seeds few, above medium, acute, several abortive; dots moderately numerous; yellow, distinct; skin thick; moderately tough; flesh yellow, crisp,

tender, moderately juicy; core medium size, partly open; subacid, high, aromatic flavour; very good quality; season evidently November to February. Originated with Mr. John Winter, Port Ryerse, Norfolk County, from whom specimens were obtained, who writes that it was bought for Strawberry King.

Darker in colour than Tompkins King and flesh not quite so coarse, but a little juicier. Flavor much the same as King. On the whole this seems to be a better apple. Specimens received from J. E. Johnson, Simcoe, Ont.

Many new varieties of apples originated at the Central Experimental Farm, Ottawa, are now fruiting, some of which are of great promise. This year there have been 656 new varieties of fruit, and 276 have fruited for the first time. The total number of varieties originated at Ottawa which have fruited is 996. Some of these varieties have already been referred to by this Committee, but the following three named last year have not been.

Rocket (Northern Spy Seedling).—Above medium size; roundish, conical; cavity deep, medium width, stem short, stout; basin deep, narrow, slightly wrinkled; calyx partly open; color yellow, washed and splashed with crimson; predominant color, crimson; seeds, medium size, acute; dots moderately numerous, yellow, distinct; bloom pinkish; skin moderately thick; moderately tough; flesh yellowish, crisp, tender, juicy; core medium; subacid, pleasant, sprightly flavor; quality good; season November, probably to January or later.

Glenton (Northern Spy Seedling).—Size above medium to large; roundish to oblate conic; cavity deep, open, russeted at base; stem medium length, stout; basin deep, medium width, wrinkled; calyx closed; color, yellow, well washed, almost covered with crimson; predominant color, crimson; seeds medium acute; dots small, moderately numerous, pale yellow distinct; skin moderately thick; moderately tender; flesh yellowish with traces of red, tender, moderately juicy; core medium; subacid, pleasant flavor; quality good; season evidently October to late November. Resembles Spy a little in outward appearance, character, flesh, and flavor.

Kim (Langford Beauty Seedling).—Medium size; roundish, regular; cavity narrow, medium depth, russeted; stem short, slender; basin deep, open, nearly smooth; calyx open; color, yellow, washed and splashed with crimson; predominant color, crimson; seeds medium size, acute; dots few, white, distinct; bloom pinkish; skin moderately thick, tender; flesh white with traces of red, crisp, juicy; core medium; subacid, sprightly pleasant flavor; quality good; season December to late winter, probably.

Resembles Langford Beauty a little in outward appearance. Quite promising.

The following notes on the characteristics of the seedlings from certain parents should prove interesting:

Characteristics of Apple Seedlings Originated in the Horticultural Division.

Descriptions are taken of the seedling apples which are originated in the Horticultural Division, whether they are good, medium or poor. By doing this, it is possible to tell after a time what parent varieties are giving the largest proportion of promisng varieties, and what the least. It gives valuable information for future work in breeding apples, as showing what characteristics of the female parent are apparent or conspicuous in the seedlings.

Fameuse Seedlings. It is generally supposed that seedlings of the Fameuse resemble the female parent in a marked degree. In this case the number of good Fameuse seedlings has been small, while a large proportion of the seedlings of McIntosh, which is a seedling of Fameuse, have been good.

Gano Seedlings. A large proportion of the seedlings resemble the female parent in regularity of form, in color in absence of flavor, and in having large seeds. A large proportion of the seedlings are winter apples like female parent.

Golden Russet Seedlings. It is interesting to note that of 19 seedlings which have fruited none have russet skins. Nearly ninety-five per cent. are green or yellow apples. A comparatively small proportion have been propagated and none have been thought good enough to name.

Langford Beauty Seedlings. A large proportion are handsome, fine-grained apples of the Fameuse type with a marked resemblance to the female parent or to Louise, a seedling of Fameuse.

Lawver Seedlings. While twenty-five per cent. of the seedlings are late-keeping apples like the female parent, it is interesting to note that a large proportion have a season before December. Some of the Lawver seedlings show marked signs of Northern Spy blood, particularly in character of flesh and flavor. Both Lawver and Northern Spy are late-blooming sorts, and were not very far apart in the orchard in 1898.

McIntosh Red Seedlings. The McIntosh is supposed to be a seedling of Fameuse, and has many Fameuse characteristics. Its seedlings have been much better than the Fameuse seedlings, over one-half of the McIntosh seedlings being thought worthy of propagation, while less than a fourth of the Fameuse seedlings were propagated.

Northern Spy Seedlings. Though self-sterile, and thus doubtless pollenized by some other variety or varieties, there has been a marked resemblance to the Northern Spy in a large proportion of the seedlings in outward appearance, flesh, and flavor, and in being late-keeping apples.

Salome Seedlings. The Salome has given some good seedlings, though the best are not from this variety. A large proportion of the seedlings bore a marked resemblance to Salome in outward appearance, flesh, and flavor.

Shiawassee Beauty Seedlings. The Shiawassee is a seedling of Fameuse. A large proportion of its seedlings had fine grained, tender flesh, and were above medium to good in quality, but the percentage thought worth propagating was about the same as the Fameuse seedlings.

Swayzie Seedlings. Only a small proportion of the seedlings resemble the parent in outward appearance, though a large percentage bear a marked resemblance to Swayzie in flav The Swayzie is a small apple, but of the seedlings, over 78 per cent. were medium to large.

Wealthy. There is a general resemblance to Wealthy in a large proportion of the seedlings, particularly in color, and the regular outline of the fruit and character of flesh and flavor.

PLUMS: The most promising new plums brought to our attention is the Omaha, reported on and described by this Committee two years ago. It is a cross between an American and a Japanese plum and combines the quality of both. It is an early bearer and very hardy, and should prove extremely useful where the European and Japanese plums do not succeed. In some parts of the country the

native plums are more profitable to the grower than the European plums in the best fruit districts, and as there are great areas where none but this kind can be grown this type of plum should not be neglected.

Some of Prof. Hansen's new hybrid plums fruited at Ottawa this year, including the Sapa, Tokeya, Kaga. The Kaga plum (Prunus Americana X Prunus Simoni) is an attractive looking plum. It should make a good shipping plum and appears hardier than most European and Japanese plums. The following description was made of it.

KAGA: Fruit somewhat heart-shaped; about the size of Lombard or larger, 1½ x 1¾ inches; cavity deep, abrupt, medium width; suture a distinct line, very slightly depressed; dots numerous, yellow, distinct; bloom bluish; skin thick, tough; flesh greenish, yellow, firm, juicy; stone below medium size, roundish cling; quality above medium to good; flavor sweet, subacid, acid next to stone and skin, spicy, pear-like flavor.

An attractive looking plum with many Japanese characteristics. It is highly perfumed.

PEARS: No new pears of merit were brought under our notice this year.

PEACHES: No specimens of absolutely new peaches of great merit were received. The Oceana is one of the newer peaches of the Crawford type which is doing well in Ontario. A new peach which J. H. Hale is introducing should prove worth trying if it is all that it is claimed to be. He suggests the name Million Dollars for it. While Haleberta has also been suggested. He states that he has tested a thousand bearing trees of this for four years and in his own words: "Believe it is unquestionably the best yellow peach in America, as it has a combination of vigor of tree, hardier of fruit bud, enormous bearing qualities, with a clean skin without the fuzz, solid flesh of a clingstone and yet one of the most free to part from the pit. Then again it has extremely fine color and is 50 per cent. better in quality than Elberta, ripening five or six days before that variety which gives it a great hold in the market. It has another advantage of remaining on the trees solid and firm for more than a week, and if picked when first ripe is solid enough to pack in barrels. I am willing to stake my reputation on this as the one greatest peach in America. I call it the Million Dollar." J. H. Hale.

The Brackett peach tested in Georgia for the past six years is another promising new peach. This peach is said to ripen just after Elberta; is of good average size and has good carrying qualities. It is a yellow peach with a bright red check, and is said to be of good quality.

The Sunbeam raspberry, one of Prof. Hansen's introductions, is proving very hardy and on this account is proving a useful new introduction for the Prairie provinces. The Herbert continues to do well.

Among currants the Boskoop Giant currant is a promising one.

Few good varieties of strawberries have been introduced in recent years, although many inferior ones are sent out each year. The splendid work the Fruit Experiment Station at Jordan Harbour, Ont., is doing in originating new varieties will be appreciated when some of their fine new sorts are introduced. Mr. Logsdail of this station has done much work in hybridizing strawberries, and it is the fruits originated by him to which I refer.

MR. BRODIE: I would like to ask Mr. Macoun about the keeping quality of MacIntosh Red.

MR. MACOUN: I can say that the MacIntosh Red is the best apple that we have in Canada. We have crossed it with the Lawver apple and have had Lawver apples of three different seasons in the cellar at one time. I know the one Mr. Brodie refers to; it is like the MacIntosh, but it will keep much longer. It is a combination of the Lawver and the MacIntosh. It just shows what you can do by keeping at it; you can get a combination of the different qualities you are after. There are of course some things that you cannot foresee; we did not foresee, for instance, that the MacIntosh was of a weak constitution, and we did not foresee that in crossing the MacIntosh with the Lawver nearly all the seedlings from that cross would be of weak constitution and weak growing trees.

THE RAILROAD WORM OR APPLE MAGGOT.

W. A. ROSS, JORDAN HARBOUR.

The Railroad Worm or Apple Maggot is not as many suppose a new pest in Ontario. Its occurrence in the County of Lennox in 1895 was recorded by the late Dr. Fletcher in the Central Farm Report for 1896. Since then it has extended its range considerably and has gained in notoriety every year. I have now records of it having been found in the following counties: Prince Edward, Lennox, Hastings, Frontenac, Northumberland, Durham, Ontario, Wentworth, Lincoln, Welland and Norfolk.

Fruit growers from the eastern counties are all more or less familiar with the work of this destructive pest. It is responsible for what are commonly called 'railroaded' or 'woody' apples. The flesh of such fruit is characterized by the presence of winding, brownish streaks, which are the burrows or tracks of tiny Railroad worms or maggots, which lead a parasite life within the fruit. These maggots are the larvae of a two-winged fly, whose handsome exterior somewhat belies its evil character. It is somewhat smaller than the house or typhoid fly, is of a general black color with yellowish head and legs, prominent greenish eyes and barred, picture wings (each wing is crossed by four dark bars). In the female there are four, in the male three white bands across the abdomen.

LIFE HISTORY: The insect passes the winter as a pupa in the soil. (The pupa somewhat resembles a kernel of wheat). In eastern Ontario adult flies first begin to put in an appearance during the second and third weeks of July, and they continue to emerge from the soil over a period of four or five weeks. The female by means of a sharp instrument—an ovipositor—punctures the skin of the apple and makes a minute, cylindrical passage in the flesh, into which the egg is laid. The egg puncture appears at first as a minute brown speck, but later on it becomes the centre of a small depression. The egg hatches in about six days' time and the young maggot, which at this stage is not visible to the naked eye, then proceeds to burrow here and there through the flesh of the apple. It may wander near the skin and work just beneath the cuticle, giving rise to those external grooves so commonly seen on infested spy apples. It is of great interest to know that the rate of growth of the larva keeps pace with the maturing of the fruit. When the maggot is full grown, the apple is almost invariably in an over-ripe to a rotten condition,

and is usually, of course, on the ground. The full grown larva leaves its apple abode and works its way into the soil to a depth ranging from ½ inch to 2 inches and pupates there. (A few larvae may go deeper than this and others may pupate immediately beneath the decaying fruit). The insect then remains at this stage in the soil over winter, and emerges as a fly the following summer.

Spread: The sluggish nature and stay-at-home tendencies of the fly make it a very poor migrant—it spreads very slowly on its own initiative. It may confine its attack to a single tree in an orchard for a few years before spreading to the neighbouring trees. As to how the insect has extended its range in this Province I can only offer theories. A considerable amount of Apple Maggot infested fruit is barreled and shipped. Maggots emerging from such fruit naturally pupate in the barrels, and so most probably the pest has been disseminated to a very large extent as pupae in barrels. Housewives may be held responsible for the introduction of the Railroad Worm into some orchards in the following way: Infested apples are bought at the market, taken home, many of them on account of their 'woody nature prove to be worthless and are thrown into the back yard and here they become a source of infection to the trees in the neighbourhood.

I believe that strong winds may be instrumental in the spread of the pest, but I can only base this belief on purely circumstantial evidence, which evidence I have not time to give you now .

Control: The most reliable remedial measure which I can yet offer you is the gathering and the destroying of the fallen fruit. Now this does not mean that drops have to be picked up every day. I am satisfied that if the summer apples are picked up twice every week, the fall apples every week and the later varieties once every two or three weeks that an infested orchard will be freed from this pest. I have found that a very high percentage of the larvae in early apples mature and leave the fruit, and also that an exceedingly high percentage of them in the winter varieties perish in the fruit; so my advice to all, who are troubled with this pest, is, attend very carefully to the destruction of summer and fall 'drops.' (This work need not be commenced in the eastern counties until the second last week of July or so.)

This control work can, of course, be done by keeping hogs, sheep or other stock in the orchard, but now, when evaporators are paying as much as from 40 to 60c. per hundred for 'drops,' even fallen apples are too valuable to be given to stock—pick them up and take them to the Evaporator. (I believe that the owners of evaporators are unconsciously doing a magnificent work in the control of this pest. Fruit growers are finding that this trade in 'drops' and 'culls' is sufficiently remunerative to more than pay for the time and labor expended in picking up apples. The result is that thousands of infested apples, which otherwise would have propagated and spread the trouble are being destroyed every year. I have on different occasions gone into evaporators in Durham and Hastings and have found 'railroad' apples).

Poultry: As I know from experience chickens are remarkably fond of the pupae; or in the case of a small infested orchard, it would be an excellent plan to cultivate the orchard and convert it into a poultry run.

Cultivation: Shallow cultivation has often been recommended as a remedial measure. It was given a trial this year but did not give very satisfactory results: however, I shall give it another trial before I lose faith in it altogether.

Spraying: A certain investigator in the States puts forward the claim that he has had splendid success in controlling this pest with a sweetened, poisonous

spray mixture. However, I do not want to advocate spraying until it has been thoroughly tested. Mr. Caesar and myself hope to try several spray mixtures next year, and our success or failure in this connection will be found in the Railroad Worm Bulletin which Mr. Caesar hopes to publish next year.

VARIETIES ATTACKED AND DEGREE OF INFESTATION: In regard to the varieties attacked and their degree of infestation I would say that Harvests, Sweets, Snows and Spies are probably the worst attacked in Ontario. I have listed over thirty varieties which I have found pest-ridden, and I am inclined to think that no variety is exempt from attack. Acid varieties are very much less subject to attack than sub-acid and sweet apples.

THE ORCHARDS INFESTED: In my season's work I noticed that all infested orchards with which I came in contact were in that class known as the "Neglected." This has also been Mr. Caesar's experience, so we are almost forced to the conclusion that in some way, unknown to us, good orchard practice keeps the Railroad Worm away.

THE PRESIDENT: What is the result of working by late fall plowing; will it bury the pupae enough to keep it there?

MR. ROSS: No; late fall plowing could not possibly bury it deep enough. I have known it to be buried as deep as fifteen inches and come up again.

A MEMBER: Wouldn't the application of lime have some effect?

MR. CAESAR: The application of lime might be of value if it were put on very thick, still I think that on the whole there is very little to be hoped for from the application of lime; so far as moth is concerned I do not think there is anything to be looked for there.

A MEMBER: What about salt?

MR. CAESAR: I do not think salt would do any good. The Department at Toronto has promised me a man, and we will have another season's work on it; it takes two years to find out results; we thought by next year that we could prove that we have destroyed it in one orchard which we have outside. It is almost all over this Province from Lennox to Welland. There is something, however, in the care of orchard. There seems to me to be something in this apart altogether from the cider factories which make it well worth a man's while to pick up his fallen fruit from the time they are a fair size, and I believe that any man with a little work can rid his orchard of them.

MR. ROSS: Mr. Dempsey has been picking up drops regularly, and has been successful in getting rid of them.

A MEMBER: Won't it do with more cultivation?

MR. ROSS: I am not sure about that.

MR. CAESAR: Mr. Dempsey has a nice orchard near the lake, and it has been affected, and there are others along the lake that have been affected; but there are a number a little bit back from the lake, and it has not gone there, showing how sluggish the creature is and how little inclined to fly. Mr. Dempsey undertook to get rid of it by destroying the trees; there were only two trees in Mr. Dempsey's and we detected another in Mr. Peck's, the only one. Prof. O'Kane was working on this for two years; he sprayed two or three badly infested ones thirteen times, using arsenate of lead, and found the sprayed trees had scarcely any perceptible difference. On the other hand, Mr. Ainsworth of Cornell is of the opinion that arsenate will destroy them. We don't want to say that arsenate of lead will destroy it, until we have another season at it.

MR. BRODIE: Did you ever try turning hogs into the orchard?

MR. ROSS: Yes; that will succeed if you have enough of them to eat them all up.

MR. ROSS: After all, the only apples you have to look after are the summer and fall drops.

A MEMBER: Are they ever in the small apples that drop off in June?

MR. ROSS: No; they do not appear until July.

THE SECRETARY: Mr. Ross is going to work next year with Dr. Hewitt and I think the doctor can give us some information.

DR. HEWITT: The work which has been done is by no means worthless, but it is not so valuable as those results which come from repetition of that work. That work has to be repeated and repeated until we have either confirmation or contradiction of your previous results; then that work is more than trebly valuable for that reason; we hope to be able to continue that work and make further experiments in conjunction with our researches regarding the curculio.

There are one or two points which have been raised in this paper. The first is that it has been found that the maggot pupates at varying depths from one and a half to more than six inches; but if you turn the maggots under deeper than that you will find, I am pretty confident, that the flies will be able to emerge. I think that they can emerge from a greater depth, for this reason. Some time ago we made experiments with the house fly, and we ascertained beyond doubt that it could and did emerge from a depth of six feet of sand, and even at this depth the fly was able to come up; so I do not think we need look for much success from any process of burying. Mr. Ross also touched on the question of spraying with sweetened arsenic which he said had been practised in the States. No work has been done in this country as yet. In South Africa we have had a number of these flies; but I do not think it originated there; it really originated in Italy. A Mr. O'Mara in the employ of the South African Government tried sweetened arsenic and was able to control it very effectively. You take the arsenic and sweeten it with molasses or something of that sort; you do not spray the whole tree, you just spray the four sides just before the emerging of the flies, and the result is that the flies, when they come out, are at first attracted by this sweetened arsenic and eat the leaves that are poisoned before they deposit their maggots. We hope to obtain the same satisfactory results as our further investigations along that line will show.

I do not think Mr. Ross mentioned this, that apart from the fact that we know that we have the greatest trouble in neglected orchards we have a number of these very flies inhabiting the native fruits. As long as you have quantities of native fruits growing in the neighbourhood of your orchards you will have great difficulty in controlling this pest.

There is a difference of opinion as to the introduction of this fly into Canada. Some say that it was introduced into Canada; others do not think it was; they say it is a native of Canada, and it was in the native fruits. It simply shows the very wide character of the investigation that is required in dealing with pests of this character.

A MEMBER: This Railroad Worm is something that is going to be hard to get rid of. It has spread pretty well all over. You take it in a town, and nearly all the orchards are neglected. You cannot turn hogs into two or three trees; we cannot plow or cultivate it; consequently they are what you call neglected trees. Unless there is some way of picking up this fruit, and unless it was made compulsory, it would be almost impossible to get rid of it. It is not quite so bad

this year as it was last year. It has spread all over our town, and there are a great many orchards affected by it. If the grass is long in the orchard it is almost impossible to pick the apples up. At that stage when the apples are on the tree they are hardly worth picking for evaporating.

A MEMBER: How does that sweetened arsenic answer on plums?

DR. HEWITT: We have not carried on very much work in connection with the plum curculio. I do not think it would be any use to spray curculio with arsenic. The plum curculio sticks its proboscis into the fruit and therefore you would have to poison the fruit to really kill the curculio. This is just the same difficulty that we have with the aphis.

THE CARE OF NEGLECTED ORCHARDS.

W. F. KYDD, SIMCOE.

My work for the last two years has been looking after neglected orchards for the Ontario Government in the Georgian Bay district. Last year I was sent from Penetang, through Orillia, Barrie and clear across till I struck Walkerton, and with the exception of three or four I did not see one that you could say had any care; some, of course, were better than others. In the County of Simcoe they have 12,000 acres of apple trees, and I think they won't average more than $25 an acre profit, and it would be a very simple thing for these men to average $100 an acre. We took several orchards, for instance one belonging to a man named Osborne. He never had more than $50 for his orchard per acre, and last year he had $225. There is another man named Hamilton; he had averaged $250; last year he received $510, and this year he has received so far $1,225 for the same orchard that he never got more than $250 for in previous years. (Applause.)

I know of very few crops that will pay as well as an apple orchard. What, then, is needed to make these orchards pay? The first thing is manure. You can take these neglected orchards and you can prune and spray them from now till doomsday, and you will never have anything worth while to show for your work. It takes all the life that there is in the ground to bear a crop this year, and there is nothing left to form a basis for a crop next year. The next thing is pruning. I know the best orchard districts in Ontario, and you can go through these well-cared for orchards and how many of these trees in these orchards will you say are thoroughly pruned? I remember one orchard in particular, and I do not know any trees anywhere that got as much pruning as these did; many thought we had cut them far too much; but I would not be at all afraid of any man thinning a tree too much; that is, the small stuff. Then, again, you must prune in time; you often hear men say that you must prune in June, but if it is small stuff I say prune it while you can. They tell us in our pruning that we must cut that little sprout off so close to the shoulder that there is no shoulder left. I know of nothing that is superior for this work than these long-handled pruners. I know with these that you leave a shoulder, but if you do not, how are you going to cut if off—it takes too much time. Only see that you prune enough. There is a light handled pruning saw,

and if you have not seen it I strongly advise you to get one; the blade is only about half an inch wide, and it will certainly cut through a stick quickly, and one beauty of it is that it will run a season without sharpening.

Then, the next thing is spraying. Of course, you are agreed about spraying. There may be some of you who believe that you can get more apples without spraying, but you cannot get them free from scab, and I doubt very much if you can get them free from worms. I know a man who does not spray and there is no scab, but every third apple has a worm in it.

Then, as to cultivation. If I had come before you three months ago I would have said it was almost a stern necessity to cultivate; but I won't go as far as that now, for one of the finest crops of apples I have seen this year had not been cultivated for years; but he had manured it most thoroughly and kept his branches very low.

There may be some of you present who have read a bulletin published by the New York State people at Geneva, speaking of a fertilized orchard. That bulletin certainly proves that in their case they got no results whatever by fertilizing an orchard; there the trees that got nothing had just as big a crop as those that were fertilized. But if you go into the thing, what did they start with—first rate agricultural land that had been in a high state of cultivation, and then they planted their trees there, and the land in all its previous history had been getting richer and not poorer. They analyzed that land and they found that there was nitrogen enough in it for 280 years and enough potash for 100 years, and of course, when you have land like that, you do not need these things.

You men that are growing apples in Ontario, don't think that you can do that sort of thing. I believe that in any kind of ground that you should plant clover or cowpeas, and you have got to fertilize your orchard to get big crops Now, I know one orchard that has not been without a big crop year after year, because they have been feeding and fattening hogs, and the land is so rich that you could not hardly help but grow fruit.

There are certain men that I have met in Ontario that do not believe much in pruning; there are some men who, to look at their trees, believe in pruning them all to poles. I know of lots of orchards where you cannot find an apple within fourteen or fifteen feet of the ground. But that is not the way to prune to ensure a good crop of apples.

Now, there is one kind of pruning I like, and that is to thin the outside of our trees. It is a simple thing to stand on the inside at the trunk, and to cut up as high as you can reach, but it is quite a labour to get up and cut on the outside. These high trees that we have so many of I would recommend you to cut some off the tops, and be careful to prune these sprouts in the proper place, and it won't be long till you have apple branches appearing again where they should never have been cut off and filling up the vacant spaces.

Now, about this cultivation. I think it very much depends in what locality this cultivation is carried on. In the north we stop cultivation in the last of June; further south, you can go on later. I think in a year like this it won't very much matter.

Now, care in handling of this fruit. I believe that on the whole we are not careful in the handling of our fruit, not half careful enough. It is often marked and bruised before it goes into the barrel. This year we tried to get a few apples

to bring to the Toronto show, and we gave instructions for them to be more than careful in the handling of them. We found, in spite of this, that most of the Spies, were bruised, and most of that was entirely due to the careless handling of the pickers. I think the time has come that we should box more of our fruit. Take our fine apples; we certainly should box more of them. The MacIntosh Red is an apple that is being planted largely in Western Ontario, and I have come to the conclusion that it should never see a barrel. I believe it ought always to be boxed, and I am glad to see so many well packed boxes. A year or two ago there were very few boxes packed; but now it seems to me it would be a strange thing if there was any country under the sun could put upon the markets of this or any other country any finer or better packed fruit than we are able to do now—than we have in our show.

There is just one more point I want to make. We want, if possible, to put a good deal more honour into our apple barrels or apple boxes than we have put in the past. I met a man in the Walker House the other day, and we got into conversation. He asked me if we were putting up any better apples here than we used to. It appears he had given some association an order for a few barrels of apples, and he had given them particular instructions that the apples were to be good all through, as good in the middle as at the ends. He said that both ends of the barrels were all right, but they were very poor in the middle.

There is nothing that has advanced in Ontario by leaps and bounds like the apple industry. More spray pumps have been used this year than were ever used before.

If you will take the list of exhibits that we have and examine them you will come to the conclusion, as I have, that we need not fear the world if we will only put our intelligence into it. There is lots of money in it.

ORCHARD METHODS THAT ARE BRINGING RESULTS.

Prof. J. W. Crow, O.A.C., Guelph.

It seems that these two subjects are nearly similar. I was very glad when I heard Mr. Kydd speak, for he drew my attention to one of the points which I had in mind to offer to you at this time. I was asked to present to you some of the results of the orchard survey work which has been carried on for the last three years by the Provincial Department of Agriculture. We have made a series of careful observations of orchards in the Lake Huron district, in the Niagara district, in a portion of the county of Prince Edward, and also in the county of Simcoe, and have placed good reliable men in these districts who have made what is practically a house to house canvass of these localities, and have secured a certain information as to their actual condition and prosperity or otherwise of the orchard industry. I may also say to you that the material prepared by these men will be issued shortly by the Department of Agriculture, and any of you who may desire to read it can procure it from the Department.

I find that I cannot give you to-day a complete review of the work of the orchard survey men, but there are one or two things I would like especially to bring out. The question of the fertilization of the orchard is one that I had in mind. I meet this question almost every day. I was asked about it this morning

by a man who found his fruit crops less than a year ago, whether or not I thought it would be advisable for him to use in his orchard potash or phosphate of soda. His orchard is in probably only a fair state of cultivation; I know it has not been for several years in a high state of cultivation. There seems to be some reason, I do not know why, that a man keeps putting that question off until he finds that his orchard is not producing the results that he thinks it ought to produce. Our Professor of Chemistry received the other day a box of soil, several pounds, taken from an orchard, and there was a letter accompanying giving us some information and asking this same question, as to what he could apply to this soil that would make it produce year after year large crops of perfect apples. Of course, no professor can tell you exactly what it requires, for the simple reason that he cannot form an accurate estimate of the quantities of each one of the things that the trees need to have. It is true that he may be able to say that there is potash enough to last 170 years, but if the trees cannot use it, it is of no value to them; there may be phosphoric acid enough to last 150 years, but the trees cannot use it now; the chemist does not know and he cannot tell.

It is safe to say that in order to have large fruit in good condition, there must be large quantities of plant food in the air or in soluble form. We do not realize yet what is possible through cultivation in the direction of liberating these supplies of plant food for the use of the trees. A couple of weeks ago I was in an orchard composed of good agricultural soil, somewhere between a clay loam and a clay, but the quantity of the fertilizers that have been applied there have been applied to no advantage; they have not paid, and it has been done at a loss. There has been a large amount of excellent fertilizers applied to many orchards, but I believe that all above a certain quantity have not been productive of results.

I have a copy of a bulletin I received recently from an experimental station in New Hampshire. They took charge at that New Hamsphire station of an orchard of 700 trees, and divided them into ten plots and have treated them differently in regard to fertilization and cultivation.

They find that the method of treatment which gives the best results is cultivation in the early part of the season. They sow crimson clover and turn that in early in the spring, and that method has given good results. In fact, it has given better results than with fertilizers in addition, although I do not know why that should be; but, at any rate, they got their best results with thorough clean cultivation with a cover crop added.

Regarding the actual fertilizer constituents there is, first of all, nitrogen. It is entirely possible to supply all the nitrogen that the trees need in the form of cover crops, such as, for instance, the crimson clover. I am perfectly satisfied that there are numerous orchards in this Province that receive too much barnyard manure.

As regards the other constituents, potash and phosphoric acid, I wish to make a positive statement, because I have so often to answer this question. Men who have been growing fruit for years will ask about the use of commercial phosphorus. In some cases I know their orchards are neglected with regard to cultivation, probably standing in sod, and except for fertilizers had little attention.

The first thing to do is to cultivate your orchard thoroughly. I think that 99 per cent. of us do not realize what efficient orchard cultivation means; we have got spraying down to a much finer point in this Province than we have orchard cultivation. Orchard cultivation must be done at the right time, and done well.

It is a very simple matter to spend a lot of money in commercial phosphorus and other things of that nature; it takes money to buy them, and if you are not going to get any increased return there is of course no use and no sense in using them.

The first thing to do is to give your orchard the best cultivation possible; and after that, if it is not in efficiency what we think it ought to be, consider the fertilizer question. Now, nitrogen produces, as you all know, an abundance of leafy growth, if present in excess; it produces green fruit and a late ripening of the fruit. I have seen this in numerous cases following an application of large quantities of stable manure. I believe that in ordinary soil five tons to the acre per year is abundance; I know orchards that receive ten tons, and some receive even more, and my private opinion is that these extra tons were wasted. This is in line with some experiments that were conducted some years ago to measure the effects of differing quantities of manure. The results of cultivation stood at 108, those of a normal application being valued at 100, and the results of an excess application also being valued at 100. From this we conclude that the excess quantity did not produce any extra result, and was therefore wasted. This is the result of fifteen years' careful experiments, and shows the extreme value of thorough cultivation, and that there is no value in an excess of manure. Proper cultivation of the soil is one of the means of liberating the chemicals in the soil; there are other means that do this, and one of these is under drainage. The apple soils of the province range from a very light sand to a heavy clay, but the bulk are loam soils. I find in the county of Northumberland a great many of the fruit growers have told me that their soil is heavy clay loam, some with a large percentage of sand, and a great many of them run from sand to sandy loam, and the sand soils, the sandy loams and the clay loams are giving the best results in that county. When apples are grown on the heavier soils these are apt to bind, and this gives rise to the necessity for underdrainage. It was found that wherever an orchard stood with part of the trees in a low spot there was a decided difference in the appearance of the trees. It is well known, of course, that winter injury strikes the low places first. It is well known that under-drainage is an important matter in agriculture and in the care of trees, and our fruit growers are beginning to learn more and more of the importance of it. On these clay loam soils any one would almost be able to see that under-drainage would be required unless there is a very decided slope. And I certainly feel like recommending under-drainage unless there is a good slope. That always would not be the case, for there are clay soils that are underlaid by gravel and under-drainage is not necessary there. When you put in a drain—and it should be three or four feet down—you keep that soil in first-class condition, and you prevent it puddling and getting hard; you let the trees get all there is for them to get and you keep that soil fertile and rich, and by that draining the roots of the trees can probably go down a foot, eighteen inches or two feet; if you give the roots a chance they will go to a great depth to provide themselves with what they need if the conditions are right, and they can secure large quantities of plant food, and the roots will extend a great distance from side to side and will also go down.

There is another method of securing the liberation of this invaluable plant food, and that is the ordinary farm practice of fall plowing. Fall plowing is recommended for fruit crops as well as for other crops, and I do not know exactly what I should say regarding it. I notice that in certain parts of the Province, especially in the county of Norfolk, fall plowing is practised every year. Of course,

the idea is that the soil is finely pulverized by frost and the plant food is thereby liberated, and the trees get a larger supply of it than they otherwise would. There is one other point in connection with fall plowing. You can get better results if the cultivation of the orchard is begun as early in spring as possible, as soon as the land is in first-class condition. I do not mean to say that the apple orchard should wait until you can get to it after the rest of the spring work is done, I mean that it should be done just as soon as the orchard soil is fit to work.

We have not been able any year to get our orchard plowed as early as I should like. We have been anywhere from one week to five weeks behind, and I can see that it would be a great benefit to the trees, and I believe it should be cultivated as early in the spring as possible.

Mr. J. H. Hale, the veteran peach grower, states that the first month's cultivation is more important than any other cultivation that you can do. If you can cultivate the first month, do so, and if you have only one month in which you can cultivate let it be the first month in the spring. Begin to cultivate as early as the soil will work; that is when the good work is done. Fall plowing is better from the winter standpoint, and I would like to see fall plowing practised so that spring cultivation could start when it ought to start. I have very frequently heard it said that fall plowed land freezes to a greater depth than if it were not plowed. I think that is a mistake. I know a number of men, to whom I have mentioned the matter, think that fall plowed land does not freeze as deeply as if it were not plowed, for the simple reason that opening up that soil lets in more or less air into the top layer and air is the best insulator you can have, and it does not seem to me that the roots of the trees will suffer as much on fall plowed land. The only thing is that fall plowed land does not hold the snow, and I can see that in an orchard where the wind gets a fair sweep at it it would be very much better to have a cover crop on there. But where an orchard is protected by windbreaks from any extra sweep of the wind I would not be at all alarmed about fall plowing. When you want to get on that land in the spring it is soft, and you cannot draw the load that you otherwise would. I find that in New York State they are using a type of waggon which they say is very successful for that particular case, which they call a handy waggon; it has a solid wooden wheel 12 inches wide. The widest I have seen here is about six inches, and a six inch tire on a wheel is a pretty heavy article for him to draw, for it sinks down under and the earth closes up over the the top of it and it has to be dragged out. I think the height of the wheel is only 20 or 22 inches. They say that on wet, soft land in the early spring it is very successful, for being solid the dirt does not get on top of it.

I am glad to have been able to present to you these points on orchard cultivation, and I will try to give any further information that I can.

THE PRESIDENT: What kind of cultivation do you use or advise?

PROF. CROW: In an ordinary orchard you might use the ordinary tools. In a low-headed orchard there are certain special types of orchard implements which are required. We used to use a spading harrow specially built for orchard work and which we liked very much indeed. We formerly used a gang plow. For getting under low headed trees they are not satisfactory; there it is best to use the extension type of harrow. These are very largely used and they will plow four feet wide and work six feet away from the off horse. It will

work the ground easily at that distance and will do it very satisfactorily, and it will throw the earth either towards the trees or away from them. We use them in working round the trees.

MR. SMITH: But if your trees are full grown that will only reach half way?

PROF. CROW: Yes, but it is still better than the gang plough.

A MEMBER: These full grown trees that you cannot reach, what would you do with them; what method of cultivation would you adopt to get under them?

PROF CROW: How large are your trees?

A MEMBER: Thirty-five or forty feet apart and they reach pretty near together. You cannot get completely up to them even with an extension disc.

PROF. CROW: What height are the trees headed to?

A MEMBER: About three feet. The branches of these low headed trees come closer to the ground.

PROF. CROW: If you are starting an orchard and wish to have the heads low, you can train them in such a way that they will interfere with cultivation scarcely at all. I have seen an orchard fifteen years old where cultivation was carried on right up to the trunk of the tree.

A MEMBER: How close to the tree?

PROF. CROW: A foot at least. We fall plowed our own orchard at Guelph last week. I have investigated the matter of fall plowing, and I have taken the question with our Professor of Soil Physics, and with our Professor of Chemistry, and with every fruit grower I could meet who had an opinion on the matter, and the only objection I could find that fall plowed land might not hold the snow. Out side of that, if your orchard is not fully exposed to the wind I do not know any reason why it should not be all right. Don't understand me as recommending fall plowing. I am merely suggesting it, and I should certainly like to see it tried. Fall plowing in an old orchard might do an injury, although it might have been injured just the same if it had been plowed in the spring. I certainly do think that the question of fall plowing is worth taking up, apart from the question of getting on the land early in the spring.

MR. DICKINSON: In a well protected orchard would you recommend fall plowing in preference to leaving a cover crop—would you leave that or would you plow?

PROF. CROW: What locality are you in?

MR. DICKINSON: Wenworth County, and the soil is clay loam.

PROF. CROW: I would fall plow. When the ground is covered with a cover crop I am quite satisfied that from the standpoint of frost protection that it does as much good when it is plowed in, except that it does not hold the snow; frost is kept out of the ground by anything which insulates and prevents the passage of heat from the soil. Anything which prevents the loss of heat keeps that soil warm, and does not let it freeze down. Simply plowing the soil loosens up the top layer four inches and works into that top layer a quantity of air. The cover crop plowed in is just the same. It permits the passage of air into the soil, and has all the effect of an insulator, except that it does not hold the snow. I have no hesitation in saying that a cover crop is just as good under the ground as it is on top.

MR. DICKINSON: If you protect your orchard you will not have trouble with the snow blowing off. A very small percentage of apples blow off. I sold my orchard to a man who packs it and sells it, and he has to take that chance. They

quite overrun my estimate, and they did that in spite of the winds that blow on it in two directions; but, as I told you, we have it pretty well protected.

PROF. CROW: I have heard several men say that there was a very slight loss from heavy winds due to the protection. That has been well tested last season; we have had winds such as have not been experienced for years, and the orchards in some situations lost pretty near half the crop. It is a matter of dollars and cents, and the tree is injured not only by the actual quantity of apples which may be blown off, but in other ways. I have seen the tips of the leaves burned crisp and brown from a strong wind in a hot day in summer, and this injury, not only from the loss of the apples, means that the leaf-area is reduced perhaps one-half, and this must be a very serious injury to the tree. It may seem a far cry from windbreaks to fall plowing and the proper cultivation of orchard soils, but they are all essential.

DR. RIGGS: I have an orchard of about 375 trees, mostly Baldwins. We did some fall plowing, about half of it, and we found that those that we plowed early in the season are good and those that were plowed in the fall are not so good.

PROF. CROW: What cultivation was given this season?

DR. RIGGS: They were cultivated this season.

PROF. CROW: About what time?

DR. RIGGS: As early as we could. I could not tell just when it was. It was shortly after the first spraying. The whole orchard received the same treatment, and half of it was plowed late in the fall, and the apple were very, very small. You could notice the line of difference between them.

PROF. CROW: Are you satisfied that the orchard had high class cultivation this season?

DR. RIGGS: It is the same orchard that I wrote you about.

PROF. CROW: Yes, I remember.

DR. RIGGS: The whole orchard received the same treatment throughout, and it had been fertilized the same way, and yet a lot of this fruit was hardly fit to pick.

A MEMBER: How deep did you plow? Perhaps you cut your feeder roots by plowing too deeply.

PROF. CROW: There is one point that I think some of these gentlemen have in mind. In spring plowing you do not plow so deeply as you do in the fall, because the land is not dry. Probably you plowed deeper in the fall than you did in the spring.

A MEMBER: Is water a good conductor of heat?

PROF. CROW: No, water is not.

A MEMBER: Would moisture held by the fall plowing have a tendency to prevent frost going into the soil?

PROF. CROW: You notice that the land that is least affected by frost is the low spots, where the land is wet.

A MEMBER: I noticed that.

PROF. CROW: Water is warmer and harder to freeze than the soil is. Had this orchard been cultivated in previous years or not?

A MEMBER: It was in a very fair state of cultivation; you said it was good.

ANOTHER MEMBER: I saw the orchard spoken of. I saw it this summer, and my impression was that it had not been cultivated very much. Apparently it was

injured by plowing; part of it was not plowed till early in the spring. There was quite a lot of apples on what was plowed in the fall; but I could see at the time that it looked as if plowing late in the fall had been the means of causing injury by last winter's severe frost—that there had been winter injury.

PROF. CROW: Do I understand you to say that it was fall plowed?

A MEMBER: The bloom had set very heavily and the apples looked good till they were the size of walnuts, but there were more apples on the unplowed portion than on the plowed.

PROF. CROW: Mr. Smith brings up the question of danger to trees because of late plowing. There certainly is danger in fall plowing; but if the plowing is done so late in the season that there is no danger of starting a second growth I do not think there would be. In November or the last week in October I should think it would be entirely impossible to start trees growing by cultivating them.

A MEMBER: I plowed a young orchard—at least, it was about fifteen years old—and it seems to me that that makes the best cover crop that you can put on. It prevents freezing, and you get good results.

MR. E. D. SMITH: Is it not possible that the fall plowing was done too deep?

A MEMBER: I did all my work in the fall, and I think it is the best time. I will guarantee that the frost will not penetrate into the fall plowed ground as far as it will into the ground that is not plowed. I have tested that. I took a crowbar and tested it. I found four inches of frost in ground that was fall plowed and eight inches on ground that was not plowed, and if the fruit growers here will only test that I think they will find that I am right. I remember once digging a drain, and we used to loosen up with the shovel every night before we quit the surface of the ground for sixteen or eighteen rods, as far as we were likely to dig the next day and leave the loose earth on it, and all we had to do in the morning was to shovel this off and go right on.

A MEMBER: I think this question of fall plowing is a very important one. In our section we have tried fall plowing very thoroughly, and we have found that there are very many great advantages in it, and we cannot see so far that there are disadvantages. We find that you can get on the land very much sooner in the spring, and in the dry season it is very beneficial to have the land well fall plowed.

MR. ROBERTSON: Does Prof. Crow think there is any great advantage in wind-breaks except in exposed locations?

PROF. CROW: What is your objection, Mr. Robertson?

MR. ROBERTSON: I have one apple tree, so I cannot speak for them, but I have cherries. I notice we gather better fruit where the wind blows through and they bear best where the wind is not cut off. I sprayed with a stiff compound of arsenate of lead, and I had more apples hanging on my one apple tree, and no fungus disease, and they hung later through these wind storms than any my neighbours had.

PROF. CROW: How far apart are your trees?

MR. ROBERTSON: About 20 feet.

PROF. CROW: I am very glad you mentioned that. Where the trees are close together and there is none too good a circulation of air, you are apt to have fungus diseases like the brown rot. Cherries rot very quickly, and the mildew on grapes is along the same line, and all these diseases flourish best where there is no movement of air. Still, I would not say that a wind-break would be a disadvantage in this case; you are growing cherries and not apples.

A MEMBER: I think we ought to realize that orchards ought to be planted much further apart than we have been in the habit of doing.

A MEMBER: Is there any pronounced difference so far as bloom is concerned between trees that are fall plowed and trees that are not.

PROF. CROW: I do not think there is much difference. If they are too much protected you will find it will do harm. There are situations, without any doubt, where a windbreak would be advisable and there are some where you do not want it. One essential with regard to an apple orchard is that you have a movement of air through each branch. If you have an orchard that stands in a low spot you want all the movement of air that you can get, but you do not pick out such a spot to put your orchard on; it ought to be on the high land or on a slope. In some cases it is necessary to cut away a part of the windbreak to allow a circulation of air. You want something that will just moderate its force, rather than check it entirely. There are some cases where you want only a fairly slight windbreak; other cases where you want all you can get. You can use hardwood trees that shed their leaves in the winter.

MR. DEMPSEY: As far as I can ascertain any one that plowed in our district came out with the trees nearly all dead.

PROF. CROW: You are thinking of the winter of 1903 and 1904. I cannot give you that information; you had a better chance than I had of observing on that point.

A MEMBER: Doesn't that arise from the orchards being cultivated too late? I know a man in Peterborough County who cultivated his orchard through October and it was scarcely any wonder that he lost his trees.

MR. DEMPSEY: We required to cultivate a little later in 1903.

A MEMBER: You had peculiar conditions in that fall. I would be scared to death to plow in my orchard in the fall; I would not do it for anybody.

A MEMBER: I plow my orchard in the fall. I am in Durham County, it was remarkable for late growth. I had quite a number of trees injured where the snow blew off. Any other winter they came through all right. I am about four miles from the lake.

MR. J. W. SMITH: There is a question that I would like to ask. I understood you to say that you plowed late in the fall, but the snow blows off?

A MEMBER: That is right.

MR. J. W. SMITH: Do they freeze in the top or in the roots. If they froze in the tops it would not be the fall plowing that would have that effect. it would be the summer cultivation that was too late.

A MEMBER: I remember well when a great many of my trees were lost; they were all root killed; the trees blossomed all right in the spring. I have always used lots of manure in the fall, and they blossomed beautifully, but they died from root killing. Unless you have a cover crop this will be so. Nobody would ever think of leaving their land bare.

FEDERAL SUPERVISION OF INSECT PESTS.

Dr. C. Gordon Hewitt, Ottawa.

This is done in three ways, by legislation, by investigation, and by education. These are the three branches of the work which we have to do, but I shall only be able to deal with the first of these to-day, namely, what can be done by legislation.

As many of you know we had in Canada up to 1910 a law known as the San Jose Scale Act, in which fumigating stations were established in different ports of entry and as a certain class of nursery stock came through these ports it was treated and fumigated with hydrocyanic acid so as to kill all the insects which happened to be on it. I think that the value of that legislation is very great and we got good results from it, because, although I think the act was introduced in 1898 the San Jose Scale had already got into Canada, still it never spread to any extent subsequent to that date. Where the scale has been introduced into Canada since that date the cases are few and far between compared with the condition of things prior to that legislation.

After that we were confronted with a more serious menace; it is all very well to legislate against one pest, but when you understand that practically fifty per cent. are pests which have been introduced from other countries you will see the danger we run. Canada being a new country and opening up rapidly will likely import large quantities of nursery stock and consequently in the interests of the fruit growers and nursery men and florists it was necessary to protect ourselves against all pests. In 1909 we discovered that there was danger that the Brown Tailed Moth and the Gypsy Moth would be introduced into Canada, and those of you who have been in the New England States and have seen their ravages, need no words of mine to know what a great danger this would be. For some time action was taken against them, but owing to what must be considered a rather short sighted policy on the part of the State officials that action was discontinued. Consequently the Gypsy Moth spread from an area of two or three hundred square miles to an area of three thousand square miles in a very short time. Now, when you understand that the State of Massachuetts alone has spent over a million dollars a year in an attempt to drive these two insects out you will realise the importance of the prevention of their introduction into this country.

We discovered one of these insects, the Brown Tailed Moth, in a shipment which came from France. It spins a small web at the end of a twig, and in these it hibernates; some of these webs contain from 150 to 300, and in some sections where the pest has now established itself we found some of these winter nests containing over 1,800 caterpillars, which enables you to realise the danger of having these winter nests brought into Canada from Europe.

We had no power to inspect nursery stock. In 1910 the Destructive Insect Pest Act was passed, and this gave us power to inspect and fumigate nursery stock the same as was given in the old San Jose Scale Act, also to inspect stock from Europe, Japan and the eastern States, where it is already prevalent, and also gave us the power which we had not before of entering places for inspection. It also provided for compensation to the importers of the stock for any stock which had to be destroyed in order to carry out the provisions of this act, for in the case of European stock the best and safest policy is to burn up the whole case.

In the following year, 1910 we were empowered to carry on that inspection, and we inspected some 2½ million plants and discovered 310 nests of the Brown

Tailed Moth. We took up the matter with the French nursery men who were exporting this stock with the result that the French government have instituted a form of nursery inspection.

Nevertheless, we cannot rely on Government inspection on the other side, because we have found that stock coming from Belgium bearing the inspector's certificate had in it nests of the Brown Tailed Moth; we have found ten nests in a case bearing this certificate. This last season we inspected over four million plants, and this year, I am sorry to say that we have the first record of the introduction of the Gypsy Moth, for in a shipment of azaleas from Belgium we found three pupae of the Gypsy Moth.

Any one who is importing nursery stock has to go through certain forms. When they are importing that stock they have to send me a notice within five days after despatching that order that they have placed that order and giving me the details. Then when that stock is shipped the importer sends me another report, and in that way we can trace up any shipment of stock that comes into Canada. By arrangement with the Customs collectors we are informed of the stock coming in, and in that way we make arrangements for our inspectors to inspect it. The inspector then goes to the importer and the importer is not permitted to unpack that stock except in the presence of the inspector. I am glad to say that in the carrying out of the provisions of this Act wherever these regulations have been complied with, that the whole work has gone on very smoothly, and the whole thing works as simply as clockwork. We have had no difficulty at all with the importers. Difficulties which have arisen have arisen through the importers not notifying us, and going on to unpack the stock without an inspector being present. I remember a shipment which was imported from Belgium and the importer immediately unpacked it and re-shipped it to different points in Ontario, without any inspection of it having been made. Of course, he claimed that the inspector would not have arrived in time and the stock would be spoiled, which was quite untrue, for when we finally traced these shipments up and inspected them, we found some of them which had not been unpacked for two days after they had been received and they were in a perfectly fresh condition. That is the way we carry on this inspection, and that is the way we endeavour to have this imported stock free from these insects, the Brown Tailed Moth and the Gypsy Moth.

Of course you are well acquainted with fumigating work, and this work is now carried on in a great many sections of the country. The Brown Tailed Moth is found in Nova Scotia, and in 1907 they started killing the winter nests during the winter. Last year the Dominion Government took over the work, and now we carry on this work in co-operation with the Provincial Government. They supply an equal number of men to what we do, and through the winter we go through the whole country, especially King's county, Annapolis, and Yarmouth counties, and scour the whole country for the nests of the Brown Tailed Moth. Last year we destroyed about five thousand nests, of which a large number contained over 1,000 caterpillars, and one contained over 1,850. In a great many instances these nests are found in the wild bush, and we endeavour to prevent the insect establishing itself in the bush.

This last year we found it in New Brunswick; there were about 100 nests in Charlotte county adjoining Maine. In addition to this method there is another way and we are endeavouring this other method. The reason why the Brown Tailed Moth and the Gypsy Moth spread so rapidly when they were introduced into this country is that when they came they left their natural enemies behind. In

their native localities they are controlled largely by means of their parasites, and whenever there is an increase in the moth there is also an enormous increase in the number of parasites, and thus they are kept under control. When they came here, however, they left their native parasites behind except in a few cases where the native insects have accommodated themselves to conditions here. The only method which the authorities of the United States have adopted is the importing of parasites from the countries from which these pests were introduced. They have arranged with the foreign countries to do this, and in the importation of parasitic material are spending about $100,000 a year, and they hope that these parasites will gradually regain their natural control as in the countries from which they came.

In New Brunswick we hope to adopt some similar plan. It is not very abundant in New Brunswick. It has spread in large numbers down the coast of maine, and what we wish to do is to establish the European parasites of the Brown Tailed Moth and the Gypsy Moth in New Brunswick before the insect gets there in very large numbers. We mean to get these parasites which we hope to establish there with our native insects, and when these pests come they will find their parasites there and they will be in a better position to establish some kind of control than if they were not there at all. We have about come to the limit of artificial methods of insect control, and we are going to see if we cannot aid nature in obtaining control by natural methods. We wish to do this before the pest becomes very extensive and it is only a normal condition which we wish to establish.

As you see the work which we are doing in no way interferes with or conflicts with the work which the Provincial Government here are carrying on. We leave the work of inspecting of orchards entirely to the Provincial Governments. They deal with these insects that have come in; we try to prevent them coming in. But of course, we are ready to step in and aid the Provincial Governments in anyway we can. This gives you some idea of the nature of the work we are intending to do in this respect.

As the President said this morning we also intend to start out on a new venture in carrying out investigation work through this Province; we have already an office in Ontario and there we intend to establish a station for carrying on investigation as to the apple maggot and the curculio, which occur in the Province. We shall make our work the study of insect pests and their means of control, and will publish the results of our work from time to time among the fruit growers of the Province.

THE PRESIDENT: Have you found a parasite that will control the codling worm

DR. HEWITT: There was one discovered in California, and an attempt was made to import it into South Africa.

MR. CAESAR: Very occasionally you will find a parasite. I have found a fly in the pupae of the codling moth, but these are rare. There is also sometimes the larvae of a little black beetle.

THE PRESIDENT: Can you do anything to encourage them.

MR. CAESAR: No. By spraying we can control the codling moth.

THE CARE OF THE PEACH ORCHARD.

F. M. Clement, Dutton.

I feel that the most difficult task of the day has been assigned to me when I am asked to talk on the Peach before the fathers of the industry. I suggested, when requested to speak on this topic, that one of our Niagara Peninsula growers be asked to take it up, but evidently they were all otherwise engaged.

It was my privilege in the summer of 1910, in company with Mr. King, now of the U. S. Department of Entomology, Washington, to complete the Orchard Survey work of the Niagara Peninsula, which was started the previous summer by W. D. Jackson, now District Representative of the Department of Agriculture at Carp, Ont. In all Mr. King and I visited about eight hundred and seventy-five fruit farms and obtained as clear a working knowledge of them as the owners felt inclined to give us. Sometimes we were received very cordially and were assisted a great deal with the work, at other times the growers were indifferent and apparently felt that we were imposing on their time and patience. However, we saw a great many orchards and collected a great deal of useful information, which has, to a large extent, been carefully written up and will be available to the growers very shortly.

It is generally supposed that the only sections of the Province that can grow peaches commercialy, profitably, are the Leamington and Niagara Districts, but such is not the case. Lambton County is fact coming to the front and has in commercial orchards now, at least 250,000 trees of various ages. Norfolk County has quite a large acreage, and all along the shore of Lake Erie, on the sand ridges some excellent orchards are to be found. At Sparta, a few miles south-east of St. Thomas, is an orchard equal to the best in Ontario, and I believe in the near future those sections that are now known only as names will be close competitors of the old established districts, especially in the markets of Western Ontario.

The greatest drawback to the newer districts is the lack of knowledge and experience in the industry. The prospective planter must depend implicitly on the instructions of the agent. But I am glad to say that in most cases they get a very good grade of trees.

There came under my notice this summer an orchard, planted this spring, where the prospective fruit grower had received no instruction whatever, with the result that the trees were planted just as they came from the Nursery. Some had broken branches, and some had broken heads, and some had branched out from near the ground and the top had died while others had grown from the top buds only. It was impossible to repair the damage and in a few years, unless the orchard is lost, we shall see an orchard with trees headed all the way from a few inches to five feet in height.

Another extreme was in the case of an orchard of about ten acres where the grower had received instructions, to head all trees at a certain height, fourteen inches I think, and he had carefully measured and cut at the height indicated regardless of the size of the trees or placing of the buds.

The kind of soil on which to plant the trees is not so important as the drainage of that soil. If the soil is wet the tree will linger along for a year or two then die. This is certain. If the subsoil is wet or hard and impervous the roots can not penetrate it and will instead spread out horizontally over it. Trees of this kind of

soil that came under my notice were invariably poor bearers: usually they did not appear healthy. In some cases men, who have the peach craze but not the peach soil, have attempted to get sufficient soil by ridging up the land and planting on the ridge, banking the trees up well. But I do not know of a single orchard giving good yields under such treatment. The soil must be sufficiently dry and pervious to allow the roots to spread in every direction. A good chestnut soil is naturally adapted to peaches.

In the less favored districts many complain that the budded stock from the Niagara Peninsula is subject to disease at the junction of the bud and the seedling root. I do not believe that this is really true, or that the trees are really diseased, but that the borer is doing the damage because of the misunderstanding of the nature of the insect and its means of control. To overcome this apparent difficulty a grower, whom I know, selected his pits from well bearing healthy trees three or four years ago and planted expecting to get good fruit like the parent tree. I did not see the parent tree, but I sincerely hope that the fruit comes fairly true, and that those that do not will, at least, produce fruit or marketable quality. The orchard will, at any rate, be of interest from a Yellow and Little Peach point of view. At present, as far as we can see, it is very hardy and healthy but we shall watch developments.

The cultivation of the orchard is widely discussed and I am sorry to say that our very best men do not agree in their opinions and methods. Shall I plow or not, how often and how deep? is often asked. Our figures show that to twenty who are getting good returns by plowing in both spring and fall, fifteen plow in the spring only, seven in the fall only, and three do not plow at all: or if figures can be relied on, among those who do not plow twice, it is doubly in favor of the spring plowing only, or having the ground go into winter as firm as possible is preferred. I believe this idea is gaining ground. But the cover crop has something to do with it, and it is fast being recognized as essential where the best methods are practised. If a cover crop is not used, especially in the bearing orchards, a mulch of strawy manure is recognized as the equal or next best.

The men who do not plow at all do not do so because of lack of time or because they are careless, but because they believe that it is not necessary. Some of our very best men do not plow at all, especially in the bearing orchards but use rather the latest extension implements and get the same results. Of course where a cover crop is used, instead of a mulch, it is almost necessary to plow, though Professor Crow has demonstrated in the College apple orchard that it was not necessary to plow there to get rid of a heavy cover of rye. He used instead the "Orchard Plow," which much resembles a large disc.

I would, too, insist that the first spring months, April, May and June are the important months as far as cultivation goes, in the life of the tree. Just at that time the tree is growing its crop of fruit, growing its new wood and setting or forming in embryo the tiny fruit buds, that must develop into next year's crop. Later, this important function, especially the setting of the buds, is over and consequently cultivation can be of no assistance to the next year's possibilities: on the contrary if it is continued too late it is often very injurious. And just as it is important to stimulate growth in the early season, so is it just as important to check it later in the season, and harden and prepare the branches and fruit buds for the winter. If the trees are bearing a heavy crop of fruit the cover crop may be left till the middle of July or first of August, but if there is only a light crop and the trees are growing very healthy the first of July is not too early, especially in the

less favored districts in this line. At any rate even if the cover crop is not sown cultivation must cease. The weeds will grow of course, but these are preferred to very late summer and fall cultivation.

Fertilizing and cultivating should be discussed together because the best and surest fertilizer is thorough cultivation. The word to manure is derived from the same word as to manoeuvre and means to work by hand. In olden times as far back as the Greeks and Romans, cultivation was recognized as a fertilizer. Barnyard manure came in later, then the cover crop, and then the commercial and fertilizers. In these days, when cover crops and manure are boomed so extremely we are inclined to lose sight of the cultivation; but I must say that a large share of our expense in commercial fertilizer is lost without it.

In fertilizing as in cultivation we have the greatest extremes. One orchard that I know has had little or no manure or fertilizer within the last seven years. But the soil has been kept well supplied with humus from, usually a leguminous cover crop plowed under every year. The orchard soil so far shows no sign of depletion and the crops of fruit are equal to or better than the average. Cultivation here, though, has been very thorough. I do not believe, however, that such a practice would prove the best on a light sand soil as it does not contain all the required fertilizer elements. The above is a sand loam soil.

In comparison with this there are many orchards that receive from a moderate to heavy dressing of farmyard manure besides some bone meal and potash every year. And these orchards do not seem to have suffered any unless it can be said that excessive wood growth is detrimental to the production of fruit buds. The most of the orchards so treated are paying excellent returns and I believe that the prize orchard of the Niagara Peninsula is fertilized in this manner. No cover crop is used but a mulch of good farmyard manure is applied in late fall or early winter and commercial fertilizer about two pounds of bone meal to one pound of muriate of potash, at the rate of about four hundred pounds per acre is applied in the spring. This is expensive treatment, but it may be necessary in some cases. What appears as ideal cultivation to me is thorough cultivation in spring and early summer, followed by a cover crop of vetches, clover or rye or a mixture about July first to fifteenth; plow under in early spring and apply bone meal and potash, two to one at the rate of about three hundred pounds per acre. Farmyard manure may take the place of the cover crop in supplying the humus and in adding organisms of decay to the soil.

I am often asked, "To what extent or how much must I cut back my trees to get best results?" That is as difficult a question to answer as those on cultivation and fertilizing. Here too, we have the two extremes. Some men that I know cut back fully two-thirds of the new growth; others cut back but little and some do not prune, cut back or thin out their trees at all until they begin to bear. These latter claim that the trees come into bearing earlier. I am not prepared to say that they do. I believe that the severely pruned come into bearing just as early. But there is a danger. Cutting back especially in early spring or late winter induces wood growth. This may be excessive and if it is, it is likely to be tender and easily injured by a cold winter. I would recommend all in the colder and less favored localities to cut back but little unless they are sure that the growth is under their control as determined from their cultivation, manuring, etc.

Thinning is practiced systematically by but few as yet. The average man can not feel at ease when his fruit is being pulled off and thrown to the ground. Trees that appear as having only a moderate crop in the spring are often much too heavily

loaded as the fruit developes towards midsummer. I thinned a few Yellow St. John trees experimentally in the summer of 1910, and I must say that the results were very marked. The three unthinned trees produced more than six thousand peaches, (mostly pit) which weighed five hundred and fifty-five pounds. The three trees that were thinned an average distance produced a little over three thousand peaches, which weighed but five pounds less, or in other words, the fruit was twice the size. I do not believe that we can realize the gain from careful thinning until we have done it or seen the results.

Without doubt there is a great future before the peach industry of Ontario, but there is still much to be learned before the growers as a whole can hope to equal the best of the Province.

ONTARIO PEACHES IN GREAT BRITAIN IN 1911.

C. A. Dobson, Jordan Harbour.

According to a pamphlet issued by Mr. Ruddick in 1897 many of the growers around Grimsby made an effort to place samples of our peaches before the British public. Unfortunately that years' experience seemed to be sufficient until 1910. Unknown to me Mr. Ruddick's department prepared a number of shipments for distribution among the principal dealers in the old country, and at the same time I had been investigating the possible condition of the market and had decided to make an effort to feel the market to see if our goods are required there. However, after considerable enquiry a sample box of peaches grown in South Africa was brought to Toronto, and I had the pleasure of being called to Toronto to examine this box and see the form of package used in South Africa which was shipped largely to the London market.

I assure you the information was most valuable. I immediately proceeded to secure the necessary supply, and forwarded about a thousand packages to Covent Garden. The result might be considered satisfactory in view of the fact that a very thorough test was made of the different varieties that are purchased in the Niagara district. We started off with the early Crawford and finished off with the Smock. However, after getting the reports from the purchasers on the other side, it was thought that it would be desirable this year if we intended to continue to confine our shipments to the Elberta variety, and I may say that we did not depart from their idea in that respect with one exception. Some 3,500 packages were shipped over there this year to the dealers in Covent Garden, and in no instance have I a report from them of any one package arriving in anything but perfect condition. This is due largely to the arrangements made by Mr. Ruddick's department, and also to the Ontario Department here, who assisted in every way possible to make this test thorough, I am satisfied from this experience that it is possible to market our peaches in Covent Garden at a profit to the grower. If the grower has perfect fruit he can undertake to double the price by making his shipments to the old country compared with what can be got from the dealers here. I do not want you to assume that we were able to do that, but it was fully 50 per cent. better than the prices which we were able to receive locally.

Great care has to be exercised in preparing shipments for the old country, and one has got to be very exact in every particular, both in the selection of the fruit

and in the manner in which the men handle it from the orchard to the packing house and in the grading, selecting, and packing, in the forwarding to the seaboard and from there to Liverpool, or whatever seaport the vessel may be going to, and from that seaport to Covent Garden in cold storage all the way.

A MEMBER: It costs money.

MR. DOBSON: Certainly it costs money. You simply cannot stop at expense if you desire to get the goods there in perfect condition. The experience that I have gone through is simply the experience of the growers and shippers in South Africa, except that they have a longer sea voyage than we have.

According to the bulletin furnished by Mr. Ruddick the South African people have a little lead on us; they started in 1906, and their shipments that year were 7,000 packages. We have not arrived at that yet; in the following year, 1907, they shipped 10,000; in 1908, 12,000; and, in 1909, 26,000. Of course, they get into the London market at a season of the year when we can never hope to; they get in there in January and March, and our peaches are in competition with the home grown or hot house peaches and we hope to secure the same price. I do not believe that they can produce larger peaches than our Elberta, but they seem to think that their's have a better flavor and texture.

I have no hesitation in making it very clear that Mr. Ruddick's general conclusions formed of this experience ought to be very good if followed right out to the letter, but there are a great many fine points to be discovered between the lines in his conclusions that can only be got by practical experience and the closest study I feel, however, that perhaps the export of peaches to England should not be confined to one or two growers, for the simple reason that this year, after making all preparations to produce a peach of the size and color that I was advised by my friends in England were what was required in their market, I found in examining the fruit before grading that many of them were too far advanced in maturity to export, and we had to use them locally. Unfortunately some days would bring out a greater number than others, and I was sorry that I was not able to check the maturity of them, but I was forced to seek a market locally, and the cry of the dealers over the telephone was, "Send us smaller peaches." These peaches that we were shipping to England we tried to get as large as possible, and they would compare very favourably in size with a good Northern Spy apple. They want something very fancy in a large peach, and we are growing not more than five baskets to the tree. We had to put these peaches on the local market, and they were put in competition with the ordinary peach, and the great trouble was that they were much too large.

People will buy a basket of peaches and will pay $1.00, $1.25 or $1.50, and they will as a rule find enough of this large size in a basket to supply their table and they will can the balance. There is a splendid market for large fruit in the Old Country. They want it and at a fair price, and they had no sooner had the first consignment than cables came back for more.

They despatched a man from Wenatchee Valley with a carload by express from New York, and they reached Covent Garden in thirteen days. On the whole, I am not finding fault with the returns from my sales this year; I am told on very credible information that Washington peaches sold at a slightly lower price than ours did.

The dealers in London quote our peaches as Ontario peaches and they now have a standing of their own. I do not feel that I have any cinch on this thing, and I will be only too pleased to give any information I can. There is no hope

whatever that we will be able to cater to that class of trade that wants to buy peaches at a very ordinary price. This must be your fixed idea from the time you start, to trim and fertilize and thin your fruit. Put your pickers in the orchard, not in the packing house. You have got to have special hands for that particular work. You cannot hope to market peaches in England on the lines that we do here locally. You must bank on at least fifteen days from the time that they leave till they are placed in the shops in London. All these things must be taken into consideration or else failure will stare a man in the face.

I will not tell you anything about my troubles or anxiety, because that goes with the success or non-success of the undertaking. Last year, 1910, I believe there was 2,500 or 2,600 packages sent over and this year about 5,000. We had trouble owing to the strike; I had completed arrangements to send shipments on September 2nd and 9th, but just at the last minute the vessels were withdrawn and it was impossible to get shipments away; therefore, that will account for the limiting of the supply that went away this year. Then the following week we were getting pretty well into the Elbertas and we just stood pat. During this winter I will endeavour to investigate further into the prospects for next year.

I do not feel now that we have got this thing started that we have got to educate the people in the old country to accept our fruit as a first-class article, as we have now got a white fleshed peach that is considered to be classed in with our later varieties. I think if we go slowly and gradually working into the market in that way we can in the course of time bring our peaches to the favorable notice of the English consumer.

There is one feature about the export of peaches, and on this I have had a great many comments, favorable and unfavorable, and I believe that the majority of them are unfavorable. Any person that has ever dreamed of being able to do an export business in London is certainly up against a proposition that will demand his closest and strictest attention to the production of the best possible fruit. There is going to be lots of fruit of the same type that we are going to ship to the old country if we supply the demand for a really first-class peach on our local market. It is impossible for any person to go to his orchard and say, "Now, I am going to ship this entire crop to England." You go to a tree and there are a number of peaches on it, and there are as many different degrees of maturity as there are peaches. In selecting for export you will keep some at home because they are too green, and you will keep others at home because they are too ripe. To select peaches at a certain stage fit for the export trade requires vastly greater skill than the selection of apples.

I would recommend very highly any person who contemplates going into the export trade to read what Mr. Ruddick and Mr. Moore, of the Department of Agriculture, have published on this subject. Get their bulletin No. 27. It goes into this question very fully, and if any items are not quite clear I will certainly be pleased to furnish my personal experience, and in that way I think we might be able to improve the status of our fruits in the old country, and convince them that we are able to produce peaches. They hardly believed that it is possible for us to grow peaches. I have had friends call me up on the long distance 'phone, and tell me that their friends in England, when they would read accounts of these peaches going forward, would hardly believe that these peaches were grown in Canada.

I delivered 3,500 boxes in Covent Garden this year, and every box was in perfect condition, and when the Dominion Government had that exhibition in the

Crystal Palace, the samples of peaches grown in the Niagara district were admitted to be the finest samples of peaches that ever entered any British port. All that you want is a first-class peach, properly packed, and you can quite fairly expect a good average price. You have got to get more money than we get here locally, for there is a great deal more trouble and expense, and if you can get one dollar here, two dollars a basket from the old country would not be too much. There is also some risk; some boxes are going to get wet, and you have got to provide against these things. That happened with me once, and of course provision was made that such an accident would not occur again. There are and may be accidents, but the prices which it is possible to obtain in the old country will compensate a person for producing a first-class article here in Canada.

As I have said before, if there is any information which I can furnish a prospective exporter I will be pleased to do it.

A MEMBBER: How ripe were the peaches?

MR. DOBSON: They were taken from the trees when they were showing a fairly good color on the fruit. We would find amongst these peaches many that were only fit for local consumption; so you can imagine they were pretty close to ripeness. You do not want to get them too green, and especially you do not want to get them too ripe, if they are coming out of cold storage.

A MEMBER: What varieties were sent from South Africa?

MR. HODGETTS: I understand that it was a yellow fleshed peach of the Crawford variety that they first sent there, but they could not sell them; they wanted only the white fleshed varieties in England. The sample of South African peach we received was somewhat like our Mountain Rose. The variety in this case was not given.

We have been sending a yellow fleshed peach because they are so largely grown here. Whether it will mean in the future that we will have to grow white fleshed peaches, I do not know.

Of course, it is to be remembered that when our peaches get there the South African peaches are all off the market. Ours and the Washington peaches are shipped over there at the same time, and the prices of the South African peaches are much higher than we have been getting. This year the Wenatchee peaches were listed at a little less than what Mr. Dobson got, 3s. 6d. to 5s. Mr. Dobson crated his, three boxes in a crate.

THE PRESIDENT: I am sure we were very glad to hear Mr. Dobson speak as he has this afternoon. I am sure he deserves the thanks of the peach growers of Ontario. I am sure we appreciate it, and we will look back to him in days to come as one of the men who has been able to open up our peach trade for us in the old country. We ourselves have done something in this line, and the small shipments that we sent over I think netted us 13½ cents a pound. It showed what could be got by shipping our fruit there.

MR. E. D. SMITH: I think Mr. Dobson deserves the thanks of the fruit growers of Ontario. It was an expensive experiment and it was on a large scale. It required courage and skill to carry the matter through, and it will be a very important factor in the peach trade in this country in the future. For that reason I would just propose that a vote of thanks be given Mr. Dobson.

MR. J. W. SMITH: I think we should, as peach men, express what we owe to our friend. There are a lot of men here older in the business than he is, and we feel that he has taken the lead not only in peach growing but also in shipping.

The motion was carried with applause.

MR. DOBSON: I must thank you, gentlemen, for your expressions; I certainly did not anticipate such kind words for so little effort on my part as I have already outlined. It will always be a source of pleasure to me to give any information in my power that will increase our prestige in the British market.

ONTARIO PEACHES IN GREAT BRITAIN IN 1911.

A. C. BIGGS, BURLINGTON.

We quite concur in the vote of thanks you gave Mr. Dobson. Many of you did so sympathetically, but we did so practically, for we have been in a practical way shipping fruit, such as peaches and apples to the old country.

It is now eight years ago since the Association started to have an exhibit in the City of Toronto. We were there at that time, and have attended every year since. At that time we had the idea we are now following out, and we have done so rather successfully; we take orders from persons for boxes of apples or peaches, and we lay them down in Great Britain for a certain amount. It is now about five years ago since my brother took home a box of Elbertas; he kept them about a week after he was home. He also suggested that at some future time we might try the experiment of making shipments. About three years ago we sent a few peaches; last year we sent from 250 to 300 boxes; this year we increased that to between 500 and 600. In packing these peaches we did not use the small box. We thought our customers probably would like at least three dozen peaches at a time, and we made a double-decked box, which did not carry so well as the single-layer box which we now have, and the result of this is we did not have one complaint.

I think it is rather wonderful when you come to consider the number of peaches and other fruit which is shipped. Mr. Dobson's experience is certainly a revelation, and not one complaint. I think that was due to the rather dry season that we have had in the past.

We have been asked, of course, to give you our experience in this year, 1911. We ship single orders or a number of them to a certain party and distribute them. They are sent direct to various points in Great Britain, and of course do not come into the market at all, so that they are not waiting any length of time in the market for sale.

Perhaps you would like to know something about how we pack these peaches. We had an orchard near St. Catharines where we grew splendid peaches, but of course were some distance away from our base of supplies at Burlington, it was not very easy for us to work. We went down with one person who had never been in a peach orchard in his life, and with one of my own daughters. We expected to have a packer to assist us but we could not obtain one, and so we packed the 500 boxes and shipped them away on the 14th of September. We had about 100 more orders than we could fill, and of course as they had sent the money with the orders and expected us to fill them the only thing we could do was to return the money.

Now, with reference to our method of packing; we use excelsior and we use wrappers. With reference to the excelsior, we get ours from the Delaney and Pettit Company of this city. It is perhaps not superior as can be got from foreign

parts, but it certainly meets the requirements of our trade to-day, and being much cheaper it would be more advisable to use it. We pack from 20 to 23 peaches in a box according to size, and double wrapped the peaches, and lined the box with excelsior. It certainly takes a little longer to do it, but it forms a better protection for the peach and the excelsior gives a good body so that there would be no danger of its rattling around in the box.

With regard to the handling, this is indeed a very important point to take into consideration. If you want the fruit to arrive there in good condition you must commence at this end and not at the other. The fruit must be grasped with the palms of the hands and not with the fingers. There were some that we thought might have been sent off a week earlier, for we felt they were fully ripe, but upon opening the boxes we were very gratified to learn that every peach was firm. It was not that it was soft, but it was all very bright in color with a nice blush upon it. Nothing could be nicer, and you may know that there must be a great deal of that care about it, if you are going to have the fruit reach its destination in good condition.

We were, of course, very anxious about this shipment, and the first gleam of good news that we had came from Montreal, saying that they had arrived there and the inspectors had inspected them and had found them in good condition. The next report was from the Quebec inspector, who reported them to be in splendid condition, and of course we felt encouraged when we got that intelligence, and we thought that everything was all right; and, as it turned out, they were delivered in good condition in all parts of Scotland and all over England.

Referring now to shipping in cold storage, as there were only a few in a box we simply expressed them to Montreal, and thus they made that portion of the journey much quicker than in the ordinary way. However, the results showed that they were turned out in as good condition as when they went in. I certainly think that quickness of despatch is one of the most important things in handling peaches. If they are too long on the road they will not be in as good condition.

The package that we had is certainly a very good package, but we wish there could be a package made that would retain the cold—something that would not allow the cold to escape, and could be closed up and sealed. The packages that we have cool our peaches very quickly, but I am told that on arriving at the docks the temperature is allowed to rise. If we could have a closed up package that would not allow the cold to escape I think it would be a great improvement on what we have now. I do not know if it can ever be constructed; some one probably with an inventive turn of mind will be able to make it for us, so that the cold would be held in it and not escape as quickly as it does at present.

A most important thing is thoroughness, and it certainly is required in dealing with such tender fruit as peaches. You must be thorough in everything you undertake. If you do not it will certainly reflect upon you afterwards. I am only just giving you our experience.

Mr. Hodgetts: Mr. Dobson has used wood wool altogether, and though it is a little more expensive than Delaney & Pettit's excelsior, we have been advised by our men in the Covent Garden market that we have got to get fancy wood wool. There is absolutely no taste or smell to it, and one complaint about the Wenatachee peaches was that they were tainted with the packing. It seems that peaches will absorb the taste of anything they are in contact with very easily.

Mr. Biggs: I have received no word of this from any of the people we ship to.

Mr. Hodgetts: They would not have any other peaches for comparison. Those who get a quantity would see it more than a person getting a single box, because they would not have anything else to compare it with.

FRUIT GROWING IN NEW BRUNSWICK.

A. G. Turney, Provincial Horticulturist, Fredericton, N.B.

I would like first of all to congratulate the management of the Exhibition upon the wonderful progress that they have made during the last two years. It was not my privilege to be in attendance at the Exhibition which was held here last year, but I was fortunate enough to be at the Exhibitions of 1908 and 1909.

In 1909 there must have been somewhere in the neighbourhood of 300 or 400 boxes on exhibition, but now I think you have somewhere in the vicinity of 3,000, and this advance in two years must be a source of much congratulation to all of you here who have been interested in Ontario fruit growing during that period.

I would also like to thank the Executive for granting permission for me to come down here and appear on your programme and also to put in a small exhibit. I can only hope that that small exhibit is not altogether out of keeping with what you are showing.

Perhaps it would be well in future for us to have a small exhibit here: it might be the means of bringing before the fruit growers of Ontario a little better impression of the fruit growing capabilities of the Province of New Brunswick. I do not think that the people here are very well informed concerning New Brunswick. In dealing with the question of fruit growing there I do not propose to touch upon the methods that are in vogue because, generally speaking, I may as well say that we have no methods at all. The people there have been growing apples as far back as 1860 or even a few years before that, and there have been large orchards in one vicinity about 125 miles north of Woodstock above St. John and on the St. John River. Mr. Sharpe, who started in to grow apples on a large scale, succeeded in getting out in a comparatively small area there of 150,000 trees. They were all practically of the one variety which they call there the New Brunswick, which I think is something the same as the Wealthy. Of course course that was a very large orchard for such early varieties, and most of their produce was shipped to the Boston market.

Mr. Sharpe planted systematically. He planted on the close system: most of his orchards were planted 10, 8, and even 6 feet apart, and with the result that when he died the orchards began to go down, until now most of them have gone altogether. I think the export last year was only about 15,000 barrels. I just mention that to show that the close planting system which has been adopted to a small extent in the Annapolis Valley, and perhaps elsewhere, very probably originated from Mr. Sharpe's method of work in New Brunswick.

That alone in a measure demonstrated that it was possible to grow apples in New Brunswick, and the work carried on in the province since that time has substantiated that. When I went there two years ago I found that there were no large orchards in the sense that you would have them here. It was not possible to go into the country and lease orchards as you do here: they would not be big

enough or uniform enough. As a matter of fact, I believe there are only four or five men in the Province who are to-day depending absolutely upon the growing of apples for a livelihood; so you see we are a long way back in the apple business.

We endeavored to start on an entirely new basis. We are trying to get orchards of 300, 400, or 500 trees established in the St. John Valley. First of all we tried to look carefully over the experiences of other Provinces, such as the Provinces of British Columbia and Nova Scotia, and after considering these experiences we ought to be able to avoid some of the costly mistakes that they have made in these Provinces.

Our best apple sections are in the southern portion of the Province. The Dominion Atlantic Railway runs from the Annapolis Valley in the Province of Nova Scotia, that is the great apple section of which you have probably heard so much, across here in the eastern end of the Province, where there is a very good apple section in Albert County. There they grow the King, the Spy, and the Ribstone very well; also in Charlotte County. We can also grow these varieties in the middle of the St. John Valley. We endeavored to confine our efforts to the McIntosh Red, and other standard varieties. The Bethel is strong and hardy, has a good color and is a good size; there is also the Duchess and an apple which we call the Dudley which in season would come in between the Wealthy and the Duchess.

Up to Woodstock you will pass excellent apple growing land and all in along the lakes, but after you get above a certain line I would not consider that commercial apple growing would be a profitable proposition.

Some of the advantages which we claim in comparison with other sections is, first of all, our geographical situation, which is very near the entry of the European market. For sixty miles up the St. John River there are thousands of acres of land which will grow the Fameuse and McIntosh Red to perfection, and you can have them taken down to St. John on scows and most of your apples will be shipped to the markets of Europe without touching a railway. The advantage of that in considering the question of cost is quite obvious, especially when you are handling fruit such as the McIntosh Red. We have no apple that requires such careful handling as the McIntosh. It will not stand as much knocking about as the Fameuse will.

Our other great advantage is in the price of land; land that will grow the McIntosh to perfection can be bought from $10 to $25 an acre; that is quite a consideration. The farms as a rule are large; they will run from 200 to 400 acres, and sometimes larger, but the percentage of cleared land is very small. Perhaps out of 400 acres only sixty or seventy acres will be cleared, and the balance will be small timber. Generally speaking, the farms there can be bought for the value of the buildings that are on them, but I am not going to attempt to explain why that is. The work that we are doing in the Department is along much the same lines as the work here. We conducted three orchard demonstrations this year, one in the St. John Valley, one in Albert county, and one in the east end of the Province.

Most of our work consists of going out and visiting people on the farms, selecting soils suited for them and advising them, and generally seeing that they get properly started.

I think that we have great opportunities for commercial apple growing in New Brunswick. I think that our geographical position cannot be beaten; I know that we have plenty of suitable land, and I have from time to time visited other

Provinces enough to be able to testify to our natural advantages, and both the soil and the climate seem to be very suitable. Indeed, I consider that it would be worth the while of any young man, especially those who have been going through college and have been looking around to acquire land for commercial apple production, to take into consideration what the Provinces of Nova Scotia and New Brunswick have to offer in that respect.

FRUIT GROWING IN NOVA SCOTIA.

W. T. Macoun, Dominion Horticulturist, Ottawa.

Before giving you my paper on fruit growing in Nova Scotia I should like to emphasize what my friend Mr. Turney has said about fruit growing in New Brunswick. I have had the pleasure of visiting that Province several times, and quite recently, at the beginning of this month, I was able to attend the Second Apple Growers' Exhibition, and it was really astonishing to one who had never seen New Brunswick apples got together what a magnificent display could be made in that country. Mr. Turney says that there are only a few men who are at present making a living out of apple growing. Largely through Mr. Turney's efforts they have got together, and the result is there is a boom in fruit growing in New Brunswick.

It is unfortunate that there is no Nova Scotian attending this meeting to tell you of orcharding in his Province, but this year the fruit growers of Nova Scotia are so busy handling their huge apple crop that not many of them are far from home at present. Under the circumstances, at the request of the Secretary of the Ontario Fruit Growers' Association, I consented to say something in regard to fruit growing in Nova Scotia, for having had nearly fourteen years' personal knowledge of fruit growing and fruit growers there, I felt that, while I could not do this Province the justice that a Nova Scotian could, I should at least be able to give you some idea of the character of the fruit industry there.

The Province of Nova Scotia has the longest horticultural history of any part of Canada with the exception, perhaps, of Quebec, where the colonists must have begun to grow fruit about the same time. In the beginning of the seventeenth century the French colonists in Acadia introduced fruits from France. History relates that apple trees were growing near the banks of some of the rivers in 1663. When the English took possession of the French gardens between 1760 and 1770 apple trees of many sorts were found growing and doubtless other fruits as well. The fruit plantations which had been neglected for several years before the English took possession must have had many seedlings growing in them, the climate of that part of Nova Scotia favoring the growth of chance seedlings. To-day seedling apple trees grow almost as readily there as native trees. It is known that the top grafting of these seedling trees with better varieties was begun as early as 1764, and some of the trees grafted at that time are still alive. On account of the poor transportation preventing a quick delivery of the fruit to the markets abroad the orchards and fruit plantations did not grow rapidly and were of comparatively small size until the last half century. When the railway from Halifax to Windsor was opened in 1855 boats delivered their cargos at Windsor and from there the

fruit was taken to Halifax. The export of fruit was, however, very small even thirty years ago, the average yearly export of apples for the years 1880 to 1885 being estimated at 23,920 barrels. While the early development, and while the main development of the fruit industry of Nova Scotia up to the present time has been in the Annapolis and Cornwallis Valleys, fruit growing is carried on in other parts of the Provinces as well. The most promising new district seems to be the south-eastern part of the Province, where there is a great area of cheap land and where apples and other fruits are doing well.

The Cornwallis and Annapolis Valleys, where most of the fruit of Nova Scotia is at present grown, is practically one valley and about one hundred miles long and from six to eleven miles in width, and lies between two ranges of hills about six hundred feet in height. On the west side of the valley the North Mountain protects the orchards from the winds which blow across the Bay of Fundy. Tidal rivers through and intersecting the valleys help to moderate the climate in winter and also moderate the heat in summer. The spring is comparatively late and the autumn usually rather cool. Most of the older orchards are planted on the lower and heavier soils, but some of the most profitable ones are on the sandy and gravelly slopes of the hills, and many orchards are being planted in such situations, as the land is usually cheaper than where the soil is heavier.

Apples, pears, plums, cherries and small fruits, and to a limited extent peaches and grapes are grown in these valleys. The mining towns of Nova Scotia, of which there are a great many, use large quantities of small fruits which are grown very successfully in most parts of the Province.

It is not possible to state how many fruit trees and bushes are growing in Nova Scotia as it is so long since the census of 1901, and that of 1911 has not yet been announced, but a good idea of the rapid development of the fruit industry may be obtained from the following figures taken from the report of the Secretary of Agriculture for Nova Scotia in 1910, showing the average export of apples:—

Export of Apples from Nova Scotia.

1880 to 1885, 23,920 barrels per annum.

1905 to 1910, 482,298 barrels per annum.

This year, when the crop is much larger than it has ever been, it is expected that 1,250,000 or possibly 1,500,000 barrels will be exported.

The Nova Scotia Fruit Growers' Association, which was organized in 1864, is a strong body, and has done much for the fruit growing industry of that Province. The Provincial Government has also assisted fruit growers to some extent, but up to the last year or two there had been no great boom in fruit growing in Nova Scotia. Like the other Maritime Provinces, Nova Scotia has suffered by the constant emigration of her young men to Western Canada and to the United States; and, while the men who remained realized what a great future there was in the fruit growing industry, they could not induce many of their sons to stay at home. There was also little, if any, co-operation among the growers, and it was left to a few enthusiastic men to do what little was done for the general welfare. Now, this is all changed, and co-operation is the watchword. During the past two seasons twenty-two co-operative associations have been formed, and while each of these associations has its local manager, a general manager for them all was appointed this year.

The fruit growers of the Annapolis Valley, and, in fact, in all parts of Nova Scotia are, most of them, intelligent men, and it but needed the co-operative move-

ment to bring about the marked advance in methods of growing and handling the crop, which is seen to-day, although the progressive fruit growers of the Annapolis Valley have long been noted for the good culture they gave their trees. With the co-operative movement came the more general use of the power sprayer, many of which have been brought during the past two years. While the apple is the principal tree fruit grown, the other common fruits, as stated already, can be grown very successfully. Some of the varieties of apples which do best in the Annapolis Valley are Gravenstein, Tompkins King, Ribston, Blenheim, Baldwin, Northern Spy, Rhode Island Greening, American Golden Russet, Roxbury Russet (known there as Nonpareil), and Wagener.

This year there were few trees of bearing age that did not have fruit, and most of the trees were almost breaking with their load, the fruit being very free from blemishes, and higher colored and better matured than usual. Barrels ran short and fruit growers lent a helping hand to the coopers to keep up the supply. One factory near Port William, we are told, turned out 1,500 barrels a day for two months, another one 1,200, and so on. There are about ten of these factories in a radius of ten miles. About 100 warehouses are scattered along the railway in the Annapolis Valley, in which the fruit is sorted, packed and stored until shipped. At some centres there are from four to five, and brick buildings are now being erected. The writer visited the Annapolis Valley during the first week of November, and found the fruit practically all safely housed. Two of the largest growers are said to have each harvested about 8,000 barrels of apples, while other yields of from 4,000 to 5,000 barrels are reported. It was expected to send 150,000 barrels to the Canadian North-West, and many of these have been shipped already, including 63,000 barrels of Gravensteins.

You are probably wishing to ask, "Well, how does Nova Scotia compare with other parts of Canada in fruit growing?" and I reply that only a Nova Scotian is able to tell you. But as there may be no Nova Scotian here to tell you, I may be permitted to say a few things in Nova Scotia's favour without overstepping the impartial stand which I, as a Dominion official, should take.

In the first place, land is still comparatively cheap in Nova Scotia. The boom has not fairly set in yet, but I notice that the C.P.R., which controls the railway running through the Annapolis Valley, is advertising the fruit industry on its time-tables. The Government is doing a great deal now in advertising the fruit lands, and no doubt still more systematic advertising will soon take place.

2nd. Trees live to be a great age in the more favored parts of Nova Scotia. A man can easily count on productive trees as long as he lives, no matter how young he may be when he plants. Apple trees more than two hundred years old are said to be growing in the Annapolis Valley. The freedom from winter injury makes orcharding a safer investment than where trees are more liable to be injured.

3rd. The markets of Great Britain, Europe and South Africa should offer a constant and ever increasing outlet for Nova Scotia fruit, not to speak of other great markets nearer home, and as the fruit can be placed on ocean steamers the same day it is picked, if need be, there is a great advantage in shortness of railway haul, both in regard to freight rates and to the condition in which the fruit arrives at port.

4th. Owing to the comparatively cool summer and autumn, as a rule Nova Scotia fruit does not mature rapidly, and when it is picked is usually very firm

and carries well, enabling the Nova Scotia fruit grower to land his fruit with a minimum loss from slack or wet barrels.

5th. The climate of the more favored parts of Nova Scotia is very suitable for many varieties of apples most in favor on the British and European markets, such as Gravenstein, Blenheim, Ribston, Cox's Orange Pippin, Tompkins King and others.

But I shall stop here, and lest I be thought to favor Nova Scotia too much I must tell you that the apple scab flourishes there in some seasons as it does in some other parts of Canada; that sometimes cool weather in spring injures the bloom, causing a partial failure of the crop; that some varieties of apples do not reach full maturity there and lack high color, and that there are a few other minor troubles which every fruit district, no matter how good, is not exempt from.

FRUIT GROWING IN QUEBEC.

NORMAN JACK, CHATEAUGUAY BASIN, QUE.

I bring to you and to your Association greetings from the Pomological Society of the Province of Quebec.

I would also like to thank you for the invitation to be present and take part in your meeting: further, Mr. President, I would like to ask your permission for Mr. Brodie to say a few words in regard to fruit growing in the Province of Quebec as soon as I am through.

I have a map here to show the northern limit to which fruit and apples can be grown in the Province of Quebec. It surprised me to look over the census of 1901 and to find that apples can be grown in almost every county of the Province of Quebec. I think some of our northern counties cannot grow apples on a large scale, except three or four as we shall see later on.

The main part of my theme will be the apple growing phase of our fruit growing, that being the chief branch in our province, although cherries, plums and pears form a good second, while small fruits keep the market well supplied, and we are surpassed nowhere in the Dominion by the sweet returns of the sugar maple.

Apples can be grown in every county in the Province, with the exception of two or three in the extreme north, and according to the census of 1901 there were over two million bushels of apples produced that year. There were 396,228 bearing trees, and 744,142 non-bearing at that time. There have been large plantings since, but the census returns are not yet published. At that time cherries rated at over 150,000 bushels, and plums 120,000.

At Abbottsford was organized the first fruit growers' association, in 1874, and published the first list of fruits that had been found suitable for this northern climate. Since that time there have been formed several district associations, holding meetings and exhibitions. The Provincial Association is known as the Pomological and Fruit Growers' Society of the Province of Quebec, and it receives an annual grant from the Provincial Government.

Experimental orchards have been established to show methods of insect destruction and give information as to the best varieties and their cultivation.

The progress of apple growing in this province has been an interesting experience for planters and marked by many vicissitudes.

Fifty years ago it was considered a lack of wisdom to plant a commercial orchard, but the unwisdom soon spread and the valleys as well as the hillsides were adorned with trees. Here thrives La Belle Fameuse which attains its perfection with the first tingle of frost. In fact, when you come to classify the apples of the Dominion, we are proud to belong to a province where one of the native born apple trees has a class by itself, and was selected for their flavor by Royalty. But alas, there is generally a cloud to every silver lining and under certain conditions this Queen of Quebec apples suffers a reverse that falls heavily upon the orchardist, taking not only the crop, but the life of the trees.

Giving a personal experience, the winter of 1903 and 1904 was an abnormal season. No rain fell from the middle of October until March, and winter set in about the middle of November without any snow protection.

In February the mercury went down to 42 below zero in low-lying lands and the result with us was the total loss of 1,500 trees, chiefly Fameuse in full bearing that had never before been injured. They were literally frozen to death for 40 below zero is the death knell of the apple tree.

The lesson of that winter is to plant on high ground, on hillside slopes, or where drainage is perfect. Yet "With all thy faults I love thee still," and the Fameuse with its sister apple the St. Lawrence will ever remain as typical of what this province can produce as regards quality in apples.

While success in fruit growing depends largely upon climate, something must be allowed for intelligent methods and vigilant attention to fighting the enemies that attack this fruit. Forty years ago he apples cultivated were comparatively free from spots and ravages of insects. So changed are conditions that the same results are not now attained without thorough and systematic spraying, and let us hope the time is not far distant when there will be legislation for the protection of orchards, and a penalty attached to the ownership of unsprayed fruit trees. It was my experience this past season to spray an orchard where for the first time the trees felt the nozzle of the spray pump, and in it several diseases and five different species of insects were discovered.

If we would make progress, we must learn from the events of the present and the errors of the past to improved methods in the future. No business thrives if neglected, and fruit growing is no exception. Yet many sensible people fancy all they have to do to btain a competence is to buy land, stick in some trees, and leave the rest to Providence while awaiting returns.

But the Province of Quebec has a stern climate, its fruit trees must be hardy and adapted to the low temperature and the grower learns by experience that a few well-tried sorts are best suited for a commercial orchard.

Just now, MacIntosh Red is in high favour, there having been such a planting boom that nursery men could not supply trees. It is a beautiful apple and stood the test in winters when others failed. After this the Fameuse and the Alexander is largely grown and profitable.

An apple tree that has been freely planted is Wealthy, a handsome fruit, and the tree is healthy and vigorous. An orchard being a beautiful sight just before harvesting, and it has been largely planted in French Canadian settlements.

Duchess of Oldenburg is a great favorite and comparatively hardy, but comes to market just when prices are low which is a disadvantage. Speaking of varieties it may perhaps be mentioned as an opinion born of experience that there is an over-

plus of summer apples that are a drug on the market though of fine quality. Yellow Transparent, Astrachan and the little juicy Tetofsky bear well and ripen about the same time, but there is no outlet for their surplus. Wolf River, Canada Red and Golden Russet are good commercial apples but we are still looking for the flawless winter apple, iron-clad in our climate combining in itself all desirable qualities and a long keeper. A large number of hardy seedlings have been tested, but the perfect winter apple is yet in the future, as far as this province is concerned.

In reading over the reports of our Society and comparing the reports of the directors of the different districts for the recent eight years, and through correspondence and conversation with those who are planting, it is interesting to note the varieties which are being chiefly planted. That even after, the great loss through winter killing which the orchardists suffered during the season of 1903 and 1904, yet many are planting quite freely of Fameuse, and that variety with MacIntosh, Alexander, Duchess, Wealthy, Wolf River and Canada Red are still popular. My own opinion has greatly changed since that time, and where at one time, I should have recommended certain varieties I should now limit myself to about six. Of the increase of orchard area, little definitely can be known until the issuing of the new census, but eminent authorities place the increase during the last decade at from ten to twenty per cent., even allowing for winter killing of the season of 1903 and 1904, they consider this a conservative estimate.

Of the marketing aspect of fruit growing and of apple growing in particular much could be said. It is a regretable fact but true nevertheless, that the Province of Quebec is much behind her sister provinces in methods of marketing. Although we are surpassed by none when it comes to quality, yet the majority of our fruit growers still cling to their obsolete method of using the larger package, namely the barrel, and have not yet seemingly adopted the bushel box for our best quality of produce. This is not altogether due to the lack of appreciation of the handier and neater package but rather as yet that the public have not been educated to buying the smaller quantity in the original package. There are a few instances where this form of package has been adopted and usually with considerable profit to the producer but as yet the barrel is most generally used.

One instance in particular is worthy of note and that is the fruit shipped by Mr. R. W. Shepherd, a member of our Association, to those of high social distinction in Great Britain. Mr. Shepherd uses the compartment case, and each individual apple is fitted into its separate compartment similar to the way eggs are packed in carriers.

In the experimental orchard at the station of the Village des Aulnais in the County of L'Islet it is remarkable how well fruit succeeds in that part of the Province about 200 miles northeast of Montreal. Here Red Astrachan, St Lawrence, Russet, Scott Winter, Switzer, Duchess, Fameuse, Wealthy and many other varieties are profitable, while such plums as Lombard, Reine Claude, Green Gage, Golden Drop and Bradshaw bear heavily, while for export are grown such good shippers as Moore's Arctic, Pond's Seedling; in fact the planting of plum trees exceed that of apple trees in this part of the province.

Richmond and May Duke Cherry trees are very productive, and this county proves that fruit can be made remunerative even in the cold north, and shipped safely to long distant markets.

The Trappist Fathers at Oka are very successful fruit growers, and their fine trees of Flemish Beauty pears heavily laden with splendid fruit proves that this province can produce as fine quality of pears as the more favored districts of Canada.

I have not given any statistics of grape culture for we cannot compete with Niagara district, but in favorable seasons like the present one, many varieties will ripen especially the earlier ones such as Warden, Duchess, Delaware, Herbert, Niagara and Brighton, while Concord the most prolific of bearing vines, ripens to a most wonderful sweetness with the unusual heat. But there is no money in grape growing in the Province of Quebec, for the uncertainty of ripening, the labor involved in winter protection and chances of late frost in spring, all combine to make the growing of grapes a commercial failure.

When you look over any instruction book that tells of the insects and diseases of fruit in our province, when we know the sudden climatic fluctuations to which we are subject, it is not to be wondered at that so many succumb, but that the fittest survive. But there is a dauntless courage in the Quebec fruitgrower, born of hard conditions and many obstacles, a courage that induces him to persevere, to win out, to make the best of adverse circumstances, and he joins these meetings listening to the counsels of practical men from more favored localities, who give their varied experience for the encouragement of those who plant their trees where, for six months of the year, frost is king.

MR. BRODIE: My friend Mr. Jack has taken me unawares and I can add very little to what he has said. We have on the Island of Montreal thought that the Fameuse is passing away, but I think it could grow the Fameuse just as well as ever, but land values on the island have got to be about $1,000 an acre, and some of the young farmers are driving automobiles, and their orchards are getting devastated with caterpillars, and that is one of the secrets of the passing away of the orchards in the neighborhood of Montreal.

If you come with me to the top of Mount Royal you can see away over into Rouville county where there are large orchards. One farmer sold his crop at $5 a barrel; he realized about $3,000 for his apples; his neighbor had 900 barrels and his apples sold for $2 a barrel.

We have to the south of Huntingdon county some of the best apple sections in the province; the only fault is that they are a little far from the railway, and they have to haul them from ten to twelve miles.

In the county of Vaudreuil we have good apples. In the Lake of Two Mountains district, where the Trappist monastery is, there is another good section; we estimate there were 100 carloads of apples shipped away from there this past season.

Mr. Jack has mentioned Montmagny county and L'Islet. Down there the water causes humidity, and they grow good apples there and grow them well. I have heard that there were 8,000 boxes of Damson plums shipped from five stations on the I. C. R. to Montreal. The man who picked these plums got $2.75 a barrel for them, and the dealer brought them to Montreal and sold them for $10.00 a barrel. They haul them in buck boards to the railway station.

I thank you very much for the privilege of addressing you, and I am very glad to be here with you.

FRUIT GROWING IN BRITISH COLUMBIA.

HAROLD JONES, MAITLAND.

I think possibly you have given me a rather hard proposition for this evening to give you an address on fruit conditions in British Columbia. I have only been there once in my life, and that was just a running visit through the Province, and all I can give you is my impressions of the Province as I saw it. Of course I judged the conditions there from the standpoint of a fruit grower. British Columbia has come into the limelight as a fruit growing country within the last few years, and we have heard a great deal about its wonderful possibilities. Everybody is interested in it, and all our eyes are turning that way. We have heard that British Columbia was going to put the rest of us out of business. Probably some of you will think that the paper which I have here is open to criticism: nevertheless I simply have to report the conditions as I saw them.

While making a trip through British Columbia last July from Victoria East, I was able to gather some information from observation and inquiries as to the present and future possibilities of the province in fruit growing. I have tried to reach the facts as they really are, and eliminate the boom statements that one hears on all sides when in the country.

The fruit growing section of Vancouver Island lies north and north-east of Victoria. For the first four and one-half miles north of the city the land is generally rough. The hills are mostly rock, showing glacial drift from the north-east to south-west, with a rather thin soil of reddish to whitish clay lying on rock or hardpan on the slopes or benches.

The draws or valleys are of a darker soil, evidently containing more humus. These are mostly used as vegetable gardens by the Chinese, and are not fruit lands, owing to seepage and frost at blooming time.

On the slopes of this clay section I saw numerous orchards of apples, pears, cherries and plums showing more or less the effects of shallow root system and lack of moisture.

Duchess and Wealthy were proving the most successful here, late winters do not seem to develop to full size and color.

The Olivet cherry is considered the best variety in this section, but I saw many of the trees showing yellow foliage and the fruit dropping seriously, in some cases, before maturity. The plums, particularly those of the prune type, were injured by severe attacks of aphids which in most cases affected the whole of the present year's growth.

Passing over a ridge about five miles north of the city, the character of the soil changes to a porous, sandy nature of considerable depth that is easy of tillage and retains moisture to a high degree. This point is known as Gordon Head. I found the apple trees here healthy and vigorous, well primed and cared for. Duchess and Wealthy showed good crops on five and six year old trees. Olivet cherries were healthy, but the fruit was dropping. Plum trees were healthy and vigorous with some aphids present, strawberries do well here, and yield large crops and handsome profits, the plantings holding good for years. The island has a very striking rain fall as it varies from 28 to 130 inches per annum. In the cultivated area the rain fall amounts to from 28 to 34 inches.

That excessive rain fall is found on the western coast. The east coast is all rock, not suitable for cultivation at all, and simply contains the scattered homes of a few fishermen; it is not fit for cutivation.

From Victoria I went to Vernon, about sixty miles south of the main line of the C. P. R., and about three hundred and fifty miles east of Vancouver city. At this point one is about in the centre of the great dry belt, where fruit growing is conducted on a very large scale, the most advanced methods being practiced. The topography of the country here is that of a very hilly rolling tableland, with numerous valleys. The rocks of the hills from which the soils are derived are largely granitic in type, making the prevailing soil types clay ones.

The clays of this section differ from those of the western section, however, in that they evidently could not have been subjected to as heavy a rainfall and leaching as those under the west side conditions, and are therefore usually richer in lime and potash. This gives them a much more fiable character and greater fertility, because of better availability of the plant food they contain. Soils of this type are almost universally considered as having high crop producing capacity, although they are inclined to be deficient in nitrogen and humus, particularly this deficiency in humus on the higher levels renders the soil less friable, more difficult to work and less fertile than the bottom lands.

It is quite a journey to walk through the orchards there, and the levels differ in the character of the soil under cultivation. It is as I say in this paper, and I gathered also from a survey of the soils that has been made, that it covers the whole of the Okanagan district and that character of the soil maintains through the whole of that section of the province.

At Lang Lake and Cold Stream Ranch I saw many hundreds of acres of apple trees under high cultivation and irrigation, mostly from one to eight years of age, though there are some orchards fifteen years and older. The trees are a perfect marvel of health and vigor, showing the marks of intelligence and care in cultivation, pruning, and all work pertaining to orcharding.

In some of the heavier clays the trees have been successfully started by digging a hole where the tree is to be planted and filling it up with sand loam drawn in for the purpose. This gives the tree a chance to establish a root system and it afterwards thrives in the clay soil as the roots strike out. In this section usually one irrigation in June or early July followed by thorough cultivation to maintain the surface mulch is sufficient. Both winter and summer pruning is given particular care and one of the strong features is the thinning of the fruit. The growers commence thinning about the middle of June, and continue up to nearly picking time. In thinning they aim to space the apples evenly over the tree, and at the same time remove all misshapen and undersized specimens which results in a harvest of nearly perfect specimens all over the tree.

In British Columbia the pruning is done with the special object of maintaining the fruit bearing spores in the very centre of the tree, so that the tree though under a very heavy load is not under any particular strain. The fruit is not carried on the outer ends of the limbs in these orchards and they try to keep the fruit well in the centre of the tree by maintaining the fruit spores so that the tree is bearing fruit right in the centre. The summer pruning also helps to thin the fruit, and let the sunlight through the tree to give coloring to the fruit on the inner spurs.

The harvesting, packing and sale of the fruit is perfectly organized. Two packing companies are operating at Vernon and vicinity, and the growers pick the fruit, draw it to the packing houses and have nothing further to do with it. The

packing companies provide the boxes, expert packers, make the sales, and pay the growers the returns less cost of package, packing, transportation and commission. This year I believe the growers received $1.03 per box net, the fruit sold at about $1.60 for No. 1.

With the present careful methods continued, and no serious injury to the trees from frost or other causes, the orchards may reasonably be expected to pay expenses and show a small profit when they reach eight years of age. It is necessary, however, to have capital to make a start, as all irrigated lands are high priced, with the annual water tax, and the high price of labor, which must all be paid for in hard cash, for nothing grows here by chance, as the country is practically a desert above the highest ditch.

At the points along Okanagan Lake I did not find conditions quite so favorable as at Long Lake. At some points here I found alkali in the soil in dangerous quantities, and in many cases trees dying from its effects.

I had a conversation with Prof. Allan of Oregon and two men employed by the Provincial Government, who were just starting out from Vernon to give an irrigation demonstration. I asked them if there was not serious danger by constant irrigation to draw the alkali in the soil to the surface in dangerous quantities, particularly in the clay soils that predominate in this section. They said there was no danger on the bench land or side hills if drainage was good, as the alkali would go to the bottoms. I said that in their impervious soils drainage was not taking place and that I considered it a dangerous condition. I asked if on the bench land where there were considerable levels without drainage if there was not danger and they partly admitted it. I saw many instances of alkali injury to pears and some apples, pears suffering first.

This is a soil condition of which the people do not consider or realize the possible outcome, and the Provincial Instructors do not seem to be giving this vital point the due consideration or the exhaustive study it deserves.

Insects have given no serious trouble so far in this province, though there is evidence to show that care and watchfulness is necessary along this line. The Codling moth does find favorable conditions along the coast, but will thrive inland. There is one colony at Victoria and one at Kamloops. The San Jose scale is reported at Spencer's Bridge, at a point isolated 20 miles from any other orchard. The aphis family is causing the most trouble and injury of any insect at present, and is very hard to control.

Slug in many cases have destroyed every green leaf on cherries, but this insect is easily controlled, and injury from this cause shows carelessness by the grower.

I did not see much evidence of the insects that trouble us so much in Ontario. The insect question is not serious. If we were as free from insects as they are in British Columbia we might think ourselves well off. They are also very free from fungus diseases.

Peaches down the Okanagan are a failure this year at all points except penticton. The temperatures run too low to make peach growing a certainty here. The temperature at summerland ran as low as 18 below zero last winter. At Long Lake it ran as low as 26 degrees below zero last winter, and there are temperatures on record very much lower. Wagner and Blenheim show the effects of low temperatures in some cases. There are some cases of canker, but many suspected cases of blight is really the effect of alkali on the tree. This is particularly noticeable on pears.

On returning to Ontario and seeing apple trees growing and bearing fruit in the fence corners, I could not help but think how many orchards throughout this Province just grow by accident, and bear fruit by accident. The crop is sold to a chance buyer by accident, and perhaps by accident the owner gets some money out of it. Then, again, I thought if this chance game were replaced by careful spraying, winter pruning, summer pruning, systematic thinning and expert packing, together with about one-half the cultivation given the orchards in British Columbia, the grower would be able to reap rewards tree for tree and acre for acre with the best orchards in any of our sister provinces. And this can be done on reasonably priced land, without the heavy cost of irrigation.

We can meet British Columbia fruit on the prairie markets at equal freights to about Regina, and the dealers will take our honestly packed fruit every time and in large quantities.

Far off hills look green, but they are very red and dusty when you get there. We have the land, the sunshine and rain, we have everything, only we need more men—more good enthusiastic fruit growers—to take advantage of these favorable conditions to make Ontario grow and grow and grow, so that she will continue to be the shining star of this great Dominion of ours.

THE PRESIDENT: I am very glad that our friend Mr. Jones came back again. I went through there, and I came back quite satisfied to be here. One thing I saw that was very marked, and that is that the people there are enthusiasts about their country. They all seemed to think that they had the only place. I expected to see some wonderful orchards near Vancouver, but when I got out there I found some miserable little orchards with a few trees here and there. If some of them had orchards like some of our fruit growers here in Ontario they would blow the roof off.

PEACH DISEASES IN ONTARIO.

Mr. L. Caesar, Lecturer in Fungus Diseases and Insects at Ontario Agricultural College, Guelph, then gave an instructive address on the common diseases of the peach in Ontario. This address has been published in Bulletin No. 201, issued by the Ontario Department of Agriculture, Toronto.

Mr. ONSLOW: Have you often found Brown Rot in nursery stock?

Mr. CAESAR: Not much; it begins to show up in about three years.

Mr. VAN BUREN: I do not know what your experience with Leaf Curl has been in this country, and we have found that where they have sprayed early they have prevented Leaf Curl entirely and have saved their trees. As a matter of fact, the spraying was done for fear of the San Jose Scale, but much to his surprise the man found that where he had not done this spraying he had lots of Leaf Curl.

Mr. J. WESLEY SMITH: We sprayed as you say in the spring before the buds started. I noticed in the older trees that possibly they would bud out two or three leaves: then they will be attacked by Leaf Curl, and I noticed that where we sprayed not a leaf was hurt.

MR. VAN BUREN: I do not like to say that spraying is an absolute cure: it is a pretty hard thing to say. It depends when the disease started. We have found in

some seasons that in certain trees of the same variety when they were not sprayed they had a big loss, and when they were sprayed there was practically no loss at all. Our nurserymen are spraying on that account more than for the San Jose Scale.

A MEMBER: A neighbor of ours in spraying his Elberta orchard found that he controlled Leaf Curl much better in the young trees than he did in the old ones; but then it may have been that he did not get up high enough.

Mr. CAESAR: If the spraying is done thoroughly you have to cover the whole tree: you have to get at every part of it, and this is, of course, much easier to do with the little trees.

MR. ONSLOW: If you can spray with rain coming on, it is of the utmost importance. The effect of the rain is to wash that spray into all the little spores, and the rain really does more good than the spraying itself. Therefore, spray whenever you can, just before a heavy rain.

Mr. CAESAR: There is one thing about spraying for disease, and that is it is more important for almost every disease that the spraying should be done just before rain rather than after. The rain won't wash it off provided it has twenty minutes to dry after it has been put on, and it is much better for the tree to put the spray on just before the rain than after the rain has gone. You see you have to wait three or four days after the rain, and by that time the disease has got started. A rain coming at the right time has a very favourable effect when you are spraying for Leaf Curl.

A MEMBER: How about spraying in the fall?

Mr. CAESAR: By all means do it in the spring; if you absolutely cannot do it in the spring do it in the fall, but if you are going to grow peaches, you must arrange to do your work at the proper time. There are orchards that are diseased with San Jose Scale that are a sickening sight for everybody that comes from St. Catharines to Queenston, and they are absolutely no use to the man that owns them. I wish some means were taken to get rid of them. The Shot-hole Borer thrives in these trees, and the wonder is that we have not had more of them when we think of the number of dead trees that are lying in these orchards. The Shot-hole Borer cannot be produced in a healthy tree. It will attack a healthy tree, but it cannot lay its eggs there. So it is a good thing to see that the dead trees are taken out before the 1st April. There are two species of it; one comes in April and the other does not come out until June; so take them all out before the end of April, and don't leave the trunks piled up for wood : take them out in the spring, pile them up, and burn them. It is also severely attacked by a parasite; there are numerous parasites: I have got three species of them. I think I can keep them from attacking a tree by coating the tree over with whitewash, made with lime and water good and thick.

A MEMBER: You would not approve either of throwing the brush over the lake bank?

Mr. CAESAR: No, I do not believe in that; if you want protection you can plant willows.

Mr. FLEMING: The damage done by hail to the branches of trees was serious two years ago. I have been looking at some of these that did not have a healthy bud, and there were the brown masses, which you speak of, or brown rot. Can this be cleaned out?

Mr. CAESAR: You cannot do it; you have got such a number. Many of you have lacked buds as the effect of hail this year, and in the Grimsby district a lot of damage was done. I was astonished to see a number of young maple trees in the

nurseries badly scarred with hail. I am watching with a great deal of interest to see what will happen. I sprayed with lime sulphur in the spring, and gave two applications about two weeks apart.

A MEMBER: The Shot-hole Borer does not confine itself to fruit trees.

MR. CAESAR: I know of no tree that it attacks except fruit trees.

A MEMBER: I had a number of willow trees that seemed to be attacked by it.

MR. CAESAR: Yes, but that is another species. I know another species that will attack both the willow tree and the poplar. It is a larger species, but not the same as the one that attacks the fruit tree.

A MEMBER: We had quite severe hail storms last season, and I have been on the watch this season to see if there is going to be any result, but there does not seem to be any result whatever; they are holding up nicely.

MR. CAESAR: The plums are just as subject as the peaches are to Little Peach, and we have found at least five trees of plums that have Little Peach, so there is no doubt that it will attack them.

MR. E. D. SMITH: Is the Little Peach sectional?

MR. CAESAR: I went up to Norfolk and investigated. I found no case of Yellows or Little Peach up around Simcoe, not one; which tends to prove that there is not so much danger from the nurserymen as we thought. There are some sections in the Niagara district where there is a little of it. From Hamilton down to Bartonville there are no diseased trees. There are certain cases clearly from nursery stock. One man put out a few trees without knowing that they had this disease: the next year he found out that the whole of his stock that he was sending out were producing this disease; so he destroyed the whole stock, and now he is all right again.

MR. E. D. SMITH: The vast majority of the disease that exists at the present time comes from other sources than the nursery stock.

MR. CAESAR: Nine-tenths of it comes from other sources than the nursery stock, I think. On the other hand, I think I can show you trees that clearly have come from nursery stock.

MR. F. G. H. PATTISON, Winona: I may say that I thoroughly agree with what Mr. Caesar has said. Many of the inspectors have come to me with some of their troubles. One man in a township which has been particularly affected with yellows and Little Peach, came to me and said, "As soon as the township council meets my job is gone." That is an example of how some township councils do in this matter.

HANDLING LITTLE PEACH AND YELLOWS IN NEW YORK ORCHARDS.

B. D. VANBUREN, ASSISTANT CHIEF, BUREA OF HORTICULTURE, ALBANY, N.Y.

Before I begin my talk I am just going to take time to agree with what one man said, and that is that I do not believe that the men whom you have doing this inspection work ought to be under the control of the township councils or held responsible by them. It is too much of a local affair, and they are likely to be influenced to some extent at least by local feeling. I know what it means to go into a man's orchard and order a lot of trees taken out. It takes a good deal of nerve, and all the time he is wondering whether the man won't get back at him. I thoroughly believe he should not be responsible to local authorities at all.

As a preface to my short talk upon the handling of Little Peach and Yellows in New York peach orchards, I want to read to you a tabulated statement giving the result of our work for the past nine seasons. These speak for themselves. The results may not be all that one would desire, but I believe that they indicate the feasibility of controlling these two serious peach troubles provided such work is done in a thorough manner by competent men.

Year.	No. of Orchards.	Estimated No. of Trees.	Yellow and Little Peach.	Per Cent. Diseased.
1902	40	62,700	2,633	4.20%
1903	40	64,700	2,005	3.10%
1904	50	90,228	829	0.90 (of 1%)
1905	50	133,860	803	0.60 (of 1%)
1906	60	129,327	901 { 549 Yell. / 352 L. P. }	0.70 (of 1%)
1907	60	115,100	730 { 392 Yell. / 338 L. P. }	0.65 (of 1%)
1908	466	418,529	11,297	2.70%
1909	501	497,374	9,247	1.86%
1910	440	506,590	4,768	0.94 (of 1%)
1911	473	564,408	8,410 { 5,080 Yell. / 3,430 L. P. }	1.49%

In 1908 the territory under inspection was increased to about five times the previous areas, containing four times the number of peach trees. A large section of this new was in bad condition from Yellows and Little Peach.

This work was taken up first eighteen or twenty miles east of Youngstown in a section along the Niagara River, and the reason this section was taken is because it is the big peach growing section in our state. There was a good deal of interest aroused in that section at one time regarding the question of controlling the Yellows and the Little Peach, which was just coming up at that time about ten years ago. I was ordered to take up that work and started out. I knew what the Yellows was, but I was not any more familiar with the disease than many another fruit grower that had not paid any great amount of attention to it at that time. In 1902 that work commenced and that year we inspected about 40 orchards containing about 62,000 trees, and we found that 2,633 had this disease or about 4.2 per cent., and the diseased trees were to be taken out. These were the only Yellow trees. I did not know the Little Peach at that time, and of course did not take any account of it. That year our law was amended so as to include the Little Peach. In 1893 we looked over some 40 orchards containing some 64,000 trees, 2,005, or 3-1 per cent. were taken out. I may say that I recall one orchard, and when we went there the first year we marked four or five trees in every row, and because of sympathy we excepted fifteen or twenty trees that shewed slight signs of Yellows or Little Peach. That was a source of contamination, and all around every one of these trees was a heavy circle of diseased trees. But that brings up another question, namely that of contagious diseases in orchards.

In 1904 we increased the number to about fifty orchards and found 829 diseased trees or only about 8-10ths of one per cent.

A MEMBER: How many inspections of an orchard do you make in a year?

Mr. VANBUREN: These orchards were inspected twice, and as soon as the territory was gone over once the second inspection was begun. The second inspection was not complete; we had not men enough. These orchards which were not

inspected twice this year, were those in the Lake Shore region which were not bad, and those in which the growers are taking every precaution.

Every peach tree in the territory is supposed to be inspected. Inspection begins about a week or ten days before first peaches ripen, usually from July 20th to August 1st. All diseased trees are plainly marked with a hatchet, and a written notice is served upon owners or lessee of premises ordering that trees found diseased be destroyed within ten days after date. This work is carried out under the direction of the New York State Commissioner of Agriculture, and if the findings of his agents are disputed a protest must be made to said Commissioner in writing within three days of date of service, said protest to act as a stay of proceedings until decided by the Commissioner himself or through authorized agents. I might state that we have never had a protest within the legal time limit, and trees marked have always been taken out except in some instances where overlooked. In some instances because of red tape and lack of help trees ordered destroyed in late summer have not been taken out until following spring, and then sometimes under protest. This work is being done by our inspectors who are regularly employed by the year in nursery, orchard and shipment inspection work. We have temporarily employed some men living in the territory under inspection, they being familiar with the two troubles looked for. We find it very hard to find extra men with the tact and knowledge necessary, as men who know these troubles are apt to be successful peach growers who can not afford to spend their time at the price we can pay.

In 1908 the total area was increased about five times by the annexing of adjoining territory. Number of orchards increased from sixty to four hundred and sixty-six and total trees from 115,100 to 418,529. In the area annexed were many orchards badly diseased and in some instances almost all the trees in individual orchards were found diseased and ordered destroyed. This brought up the total percentage to 2.7 per cent., which decreased in 1909 to 1.86 per cent, 1910, to 94 per cent. The past season we have our first real increase in percentage of diseased trees found since this work commenced. The same territory inspected last year gives an increase from 94 per cent. last year or in 1910 to 1.49 per cent. this past season of 1911. This is hard to account for. The territory has not been under my personal supervision the past two years, but I believe the work has been thorough. Trees were marked closer, however, this year, as our men are becoming more expert, and this may account in part for increased percentage. Previous to last year we served notice to destroy within fifteen days, and it was generally understood that we would only insist upon their removal before blossoming next spring. We believe that this is a mistake, and we are now serving notice ordering removal within ten days and as soon as possible after final inspection will send a man around to see if marked trees have been removed, and if he reports not, we shall put the matter in the hands of the Attorney-General for prosecution. In large orchards our men take two rows at a time, inspecting carefully all suspicious trees and marking them plainly at once if found diseased.

Hale, the Connecticut peach king, three years ago visited the section, looked through many of the orchards, and said he would not have believed that there was a section in the north so free from these two diseases, if he had not actually had the chance personally to go through the large orchards and had seen hardly a diseased tree.

We have done nothing as yet relative to the finding and destroying of trees effected with these troubles in the nursery. We have not been sure in the past than an affected tree can often, if ever, be detected in the nursery row at one year

old. Evidence is apparently accumulating that some times trees may be budded from a tainted strain, and this may be an important line for investigation and work in the future.

Peach growers of Ontario must, and I believe do, realize the importance of these troubles. I have studied it in the peach-growing sections of the east for the past ten years, and you cannot find a successful commercial peach grower to-day who was producing peaches ten years ago who does not follow the practice of cutting out diseased trees as soon as found. Our three or four largest and most successful growers take no chances, and often use the ax upon trees that our inspectors would not dare mark, believing they can well sacrifice a few healthy, but suspicious, trees rather than take the chance of allowing a diseased tree to stand for a year or two scattering its contamination in its unknown way.

We have three classes of inspectors, the first comes in through the civil service and they receive $60 a month, and they have a chance of promotion up to $1,500 a year, and without any question we have got men who are worth that.

A MEMBER: How many inspectors have you now?

Mr. VANBUREN: We have four or five getting $1,500; three getting $1,320; six or eight at $1,200; one at $1,000 and six or eight at $720.

Prof. Black says that he is going to go out this winter and will continue investigations as to contaminated strains. He says that he is beginning to believe that he can tell a diseased tree in the nursery stock.

Mr. CAESAR: I think that is the only way to do; we tried the same thing.

Mr. VANBUREN: That was Graham's object. Graham declared that Yellows could be traced in the nursery, and he proved it so conclusively that one nurseryman took out his entire stock and had it destroyed.

I might give you the figures of two or three orchards. Here is the Folger orchard of about 6,000 trees. This man cut down trees at the first intimation; he did not wait for us. We looked over these 6,000 trees and found two trees diseased last year; the year previous we found the same number. There was another orchard that had about 3,000 trees, and had the same kind of care, and in 1908 we found six trees, 1909, nine trees; in 1910 six trees, and in 1911, eight trees. That is in an orchard of 3,000 trees, where the man is very careful to cut away at the first intimation of any trouble. Here is another orchard of about 2,500 trees. In 1908 we found six trees; in 1909 two, in 1910 two, and in 1911, we found seven. We have a large number of orchards right along in that section where the most thorough cutting has been followed for the last ten years, and where the percentage of diseased trees in some instances has never been more than one-quarter of one per cent. I know of one orchard where this has run down to one tree in a thousand. I have seen that man cut down yellow trees that were affected only with spot. I told him I was sure they were not diseased, and he said, "All right. I will leave them another year." I came up there four days later and I noticed the trees were all down. He said, "I had my experience; I lost a whole orchard once by leaving in some trees, and you bet I don't do it again."

Mr. CAESAR: Can you tell the people here anything about the results in any other district before they started to treat Yellows?

Mr. VANBUREN: They lost their whole orchards. Wallace Ward is the second largest peach grower in New York State. I marked half of one orchard that year, and he said: "I have had my lesson: I will see that nothing of that kind ever occurs again." Many of these growers had their orchards affected with Yellows to the extent of 60 or 70 per cent. I remember one orchard that I have noticed

for years up near LaSalle. I took the matter up with him several years ago, when he had the same thing in his orchard, and he thought he could control it by fertilizing and pruning; but it was a failure, and he cut it down. On this same piece of ground an orchard has been set out again. They are not excessive fertilizers over there, but they are following good spraying methods.

Mr. FLEMING: Does the State pay any compensation?

Mr. VANBUREN: I do not know why they should. It is a source of contagion, and is no value to the man, and I do not believe that that should be the policy of the State or Government. The tree is worthless. I think the Government might, perhaps, be asked to pay for trees that are destroyed on suspicion; but I would say: Do not pay him at all if the tree is clearly diseased: and there is no doubt about it, for you are doing the man a kindness, even if he does not appreciate it.

There is one point that the yellow sprouts always have a very strong upward tendency, and this should be very carefully looked for in diagnosing a case of Little Peach or Yellows. It is a characteristic symptom. In winters where there has been severe root injury, I have seen symptoms following these winters somewhat like those of Little Peach and Yellows, and I think that has followed where there has been fall plowing, and where there has been no cover crop of any thickness. We have had more or less trouble, and there have been a good many trees that have been killed and a good many of these trees have puzzled the best inspectors I have ever had, and I have been often puzzled about it myself.

I have seen orchards where the ordinary fruit grower looking at it from the road would think it was all right, and upon close examination you would see that it was infested with the mite.

A MEMBER: I have been growing peaches for about 25 years, and at the present time I have about 7,000 trees. I cut out this year from fifteen to twenty, and I do not think there is one case of Little Peach in it, and not over half a dozen of this disease that is called the Yellows. Some of them were trees that had spent themselves, old trees. I contend that every fruit grower who intends to stay in the business should be his own inspector. If he is not, he should get out of the business, not only for his own interest but for the interests of his neighbors. I do not know a great deal about many of these diseases mentioned, but I do not think that any inspector can go into my orchard and point out many trees that ought to be taken out.

Mr. VANBUREN: I agree with that man, and appreciate the stand he takes.

A MEMBER: If you are a little doubtful, take the tree out. Every man should be his own inspector.

Mr. VANBUREN: That is what is generally followed by the best fruit growers in New York State. Some of them pride themselves on the fact that when we go through their orchards we cannot find a diseased tree that we can mark. Mr. Caesar also said that no young man, unless he has been thoroughly experienced as a fruit grower, ought to go out alone; he must go out with an experienced man. If he lacks experience he must not go out alone, for if there is a doubtful tree he is going to pass it by. If two go together the inexperienced man can pick out the doubtful trees, and the other one can coach him and much better results are attained. I will say that even under the civil service examinations our recruits are largely bright young men who have worked up in some of the agricultural colleges. We get some who are first-rate, and some, of course, who are useless, and we have had to get rid of them. If they are not good we do not advance them. One good man is worth two or three poor ones.

I believe this is a question of the utmost importance to a commercial fruit growing section. I doubt whether it will ever mean as much for the individual grower. Some of the worst cases of Yellows I have ever seen have been in sections which are not commercial fruit growing sections, where the individual farmer had ten or fifteen trees and every tree infested with Yellows. As far as I am concerned I would just as soon let these people go, for it is too much trouble to look after them.

A MEMBER: Is there any danger of carrying the disease by pruning?

Mr. VANBUREN: I have heard people say that there was but I doubt it. Pruning is usually done in the winter time, and I never heard a man say that this had been the case. I have generally thought that the contamination was carried during the summer time. I have got nothing to base my conclusion on, but I just think that is how it is done.

A MEMBER: I have heard the statement made by prominent peach growers that it is just a question of fertilizing and cultivation. Have you noticed that this makes any difference?

Mr. VANBUREN: No, I have not observed that. The man who practises good cultivation and is a good fertilizer is the man who takes the trees out, and whose trees are generally free from disease. I know in some sections of Delaware and Maryland they did not cut out their trees very well, the consequence was they lost all their orchards.

A MEMBER: I remember that Dr. Dugger once paid me a visit. I showed him my orchard and he was surprised at it: he said that he did not see how the soil could contain any more humus than it had.

Mr. CAESAR: Conclusive experiments were made by Dr. Irvine Smith. Some 645 trees were tested with good fertiliser, and every tree that went through the test died. In another case 2,638 trees out of 3,800 died from the Yellows in spite of the best fertilizing that we could do. It could not be the fault of the soil, for we had good soil, and the most careful and favorable methods of applying the fertilizers.

A MEMBER: Is any one kind more liable to this disease than another? A great many of the nurserymen are getting their pits from the canning factories.

Mr. VANBUREN: I used to say when I first went to work that the Early Crawford was more inclined to it, and I thought that the Smock was almost immune. Then I found that the Smock had it, too: and now I do not think that there is any one kind that is any more liable to have it han another. Every tree will show the disease by the time it has stood three years in the orchard, and a large number show it in the second year: perhaps all, I think during the second year.

A MEMBER: Do the trees nearest the diseased tree take the disease quicker?

MR. VANBUREN: Yes. We found one orchard where the man had removed three trees that had Yellows. Right around each of these trees there was a ring of trees that were diseased. I have seen a good many of them and there is no question in my mind that the diseased trees are more likely to give it to others that are near than those that are a long disance away.

A MEMBER: Is it possible for the honey bee to carry this disease from one tree to another?

Mr. VANBUREN: I think a good deal of the honey bee. I do not know that I am just ready to blame them. I understand there is nothing to support it. I firmly believe that there is investigation work now in progress which is going to show what this disease is and how it spreads. Some people believe it has been caused by certain weather conditions, such as very hot winds or extreme drought. I

do not believe that. I think it is more likely to be caused by winter injury. I believe it is quite possible that it is carried by pollen.

Mr. CAESAR: Black is quite opposed to the idea that it is carried by the bee. If it were carried by the bee every tree in the orchard would be infected.

MR. VANBUREN: I am not an experimenter or a scientist, but I have had lines of thought that careful scientific investigation would be worth while. I believe it is being put into practice at the present time, and I hope with some results.

A MEMBER: You are speaking about an old orchard—taking it out and setting it over again. Do you think it would be better to wait a while?

Mr. VANBUREN: I have seen a Yellow tree taken out and a new one put in, and I have never seen these trees go with the Yellows in any larger proportion than the other trees. All the same in the case of trees cut out on account of Yellows I think I would wait a few years.

Mr. ARMSTRONG: Yellows and Little Peach originate in my opinion with an insect or a fungus. It just comes in the same way as blood poisoning. A man gets a little scratch on his hand, and there is a little opening for the disease. I imagine I know the insect. I was after him for a description and I could not get it. It comes of a large family. I have known it for thirty years. I was on his track a good while ago. I had the idea some years ago, but hesitated to fasten the trouble on it. I did not want to accuse it as guilty before I had a little more information. It naturally likes lamb better than mutton, and he goes for the young trees, but you find him in the old orchard as well.

Mr. VANBUREN: I agree with the gentleman that it may be closely allied to blood poisoning, or something of that kind. I do not know that an affected tree is much more likely to develop Yellows or Little Peach; if he knows a case of it he knows more than anybody else that I know.

As to the question whether any one variety is more susceptible than another: Some years ago before we had any Yellows we set out a quantity of trees, and in due time in two or three places Yellows crept out, and there were no Yellows anywhere else about, and it must have been in the strain so far as I know. Other trees may not be contaminated. It may attack eight or ten different trees, and only one of these trees may develop Yellows, yet a certain proportion may have been contaminated. I do not know that we have anything to show us that Yellows spreads from any particular tree in the nursery.

FINANCIAL REPORT.

The annual financial report was read by the Secretary, Mr. Hodgetts, and on motion of Mr. Harkness, seconded by Mr. Dewar, was duly adopted.

SUCCESSFUL HANDLING OF LEASED ORCHARDS.

Dr. C. H. Riggs, Cared-For Orchard Company, Toronto.

I had intended when asked upon this subject merely to give you a few remarks upon it, and upon the different headings that I considered necessary from the commercial side of it; but the more I thought upon the subject the more I found out that it was necessary to enlarge upon that little paper which I first had in mind. So what I have prepared will merely touch on the different subjects, and afterwards perhaps there may be some things that I can tell you, for I assume that we are all interested and that we will all gain by discussion.

Any statistics quoted are as examples or illustrations of an argument, not as accurate records of actual facts.

Naturally there are many points to be considered in the selection of orchards for successful commercial treatment such as:—Their geographical positions, convenience of transport to market, the facilities for obtaining labour when required, the care of access and egress to and from their official centre, water supply, the class of fruit that several orchards bear, the total number of trees to be secured.

With regard to the transport conveniences, if the roads are good the distance to the nearest railway station or steamer wharf does not require to be greatly taken into account; but if the roads are bad, it is absolutely necessary to be close to your means of distribution.

Suitable orchards for operating on should be selected in a district which has been well proved, and not subject to late and early frosts. In such districts the conveniences extended by transport companies and other companies allied with the fruit trade are well worth considering, and are greater than could be obtained in a district not so well known.

The labor question being of so much importance in the picking season, a district must be thoroughly investigated as to the likelihood of obtaining resident labor, or of keeping imported labor until the crop is safely disposed of.

When orchards are scattered and at long distances from one another, the time lost in handling plants and instruments is a serious charge on revenue, while the greater difficulty experienced in overseeing is likely to make a large abstract loss, which at the season's end may prove to be a very real one. The plantations should all be chosen so that they can be operated, from a central point, where labor, plants and management are resident.

Class of Fruit.—The class of fruit should be carefully looked into, as to whether they are all suited for the same treatment, how their crop-picking season may be synonymous, allowing of their being picked in the shortest time, and so leaving the greatest period for careful selection, packing and distribution with the minimum amounts of labor.

Number of Trees.—Spraying and other machines whose capacity is known, or can be estimated, enter largely into the successful determination of how much land can be profitably worked. Leases should be secured for orchards in such proportion, that the plant can be worked to its fullest capacity.

Once a judicious selection has been made and the necessary leases secured, the treatment and care of them calls for attention, and depending on the intensity of culture,—is the quality of the fruit. A careful review of the condition of the trees will lead to discrimination as to the amount of scraping, pruning, etc., requiring to

be done, and men should be looked for capable of giving the best results in such operations. These men should be given a definite number of trees to look after with further remuneration to their wages, according to the results shown when the crop is gathered in.

In scraping, the points to be aimed at are absolute removal of all loose pieces of bark, fungus, and other projections about the trunk and limbs, likely, if left on, to give lodgment to insect life, such would prove disastrous to the tree and the fruit, later on, and would prevent spraying operations from being fully effective.

Fruit growers in general are fairly unanimous as to the last methods of pruning, being the removal of centre shoots not required to form fruit-bearing limbs, and all wood not likely to give fruit-bearing surface on the outside of the tree. That is to say, it seems to be the consensus of opinion that trees should be pruned so that their foliage is in the nature of a dome or half ball, with the top considerably thinned, allowing the maximum amount of air and light to get to the fruit. This shape also enables the fruit to form in the most suitable position for spraying and other operations to reach it in the most desired manner.

Great care should be exercised in the saving of the weeping ends of the outer limbs, as they are great fruit producers, and receive the greatest support to protect the fruit from being removed by wind storms.

There is much divergence of opinion regarding the proper time to spray, the number of spraying applications, and the composition of the most suitable liquid likely to give the best results.

Contrary to general practice by spraying with a strong solution of lime-sulphur and arsenate of lead just previous to the bud formation, the ravages of the Bud Moth are generally checked, and the prevention of San Jase Scale very effective.

The Bud Moth is present before the foliage commences to come on the tree. It deposits its eggs just after the formation of the bud. The worm then eating its way through, brings about the malformation of the fruit, which gradually becomes more accentuated as the apples increase in size. The early and thorough spraying with the added arsenic prevents the presence of the pest to a very considerable extent.

A spray of this same strength and composition applied in mid summer, contrary to past practice, does not destroy or impair the foliage in any way, as it is generally supposed. It is recommended after a thorough trial, as giving surprising results. This application forms a skin on the fruit which prevents all pests from obtaining encouragement, keeps off the San Jose Scale, and enhances the quality to an appreciable extent.

While no definite determination of how San Jose Scale becomes disseminated has been formed, it is thought that useless trees infested with it should be destroyed in the common interests.

Inspectors are too lenient regarding the presence of this scale, and could do much to check it by bringing about the destruction of worthless trees, where it is present.

The strong spray advocated in midsummer, preferably about the middle of July, improves the keeping qualities of fruit to such an extent that apples kept in a warm place for seven weeks show only a slight shrivelling up, but no sign of decay.

It brings the color of the fruit to perfection when allowed to ripen on the trees, and in the case of Greenings in particular, makes them almost indistinguishable from the Newtown Pippin.

It is believed that for size, shape, color, and keeping quality, the Greening can be made as marketable as the Newtown Pippin, with this treatment. It is hardly necessary to state that a weak spray should be used on the tender growth of wood and foliage, just after the blossom leaves fall.

It appears that a fourth spraying with strong lime, and sulphur, omitting the arsenate of lead, applied late in August tends to bring out the colour and thereby give greater selling qualities to the fruit.

The leaves of the tree retain their vivid colour and strength for a much longer period, showing a healthier state and condition, certain to prove beneficial in the following season.

When the fruit is sufficiently advanced thorough thinning should be carried out. This can hardly be done too thoroughly, and on it the size of the fruit obtained chiefly depends. A very heavy thinning may be undertaken and yet the apples remaining may be too numerous for them to arrive at their highest state of perfection.

The thinning can hardly be too liberal, and will well reward the time and expenditure on it by the excellent quality obtained in the resulting fruit. In fact no orchard can be brought to a successful commercial issue unless this be done. As careful thinning insures an annual crop and much choice fruit.

Supply of water should be so arranged that it is most accessible to the greatest number of trees, and a boiling plant erected nearby, if home-boiled spray is to be used. Cement cisterns holding enough water for the season's use should be built.

Handling the crop in the picking season presents many difficulties, but it is believed to be the most economical to house the workers in camp, situated in the unit of trees being dealt with at the time.

When the work is complete in the particular group chosen the camp is removed bodily to the next group of trees to be worked. At the same time it may be remarked that the camp cook or some other member of the gang should be chosen for his abilities in entertaining, more especially in the case of Italian or other foreign labour. One with a large repertoire of songs, with ability to accompany his own or others on some instrument during the evening, does much to add to the gaiety and good fellowship which results in good work, and gives a good return for a little extra remuneration.

The difficulty experienced in getting the crop picked might be considerably alleviated, were the orchards sown in clover, cut and left under the trees to prevent falling fruit from being marked and bruised. This, if allowed to rot, will form a good manure, when assisted by acid phosphates and potash. When apples fall into mud, and lie for a short time, though not marked, the part of the skin submerged becomes soft, and allows decay to set in very rapidly. To take care of wind fallen fruit, and all apples not strictly classed as firsts or fancy, the erection of an evaporating plant should prove a very sound investment. It is believed that no other fruit than fancy, and firsts, should be packed for shipment. There is a decided objection to seconds, and the price falls off in much greater proportion than the quality would warrant.

The evaporating plant could only be operated by large concerns, but a company formed in fruit bearing districts should earn substantial dividends, and the attention of orchardists is called to the profitable results certain to be attained by the erection of a co-operative plant.

Close and scientific observation and experiment is called for in the fruit growing industry. The results of primary experiment, generally leads to a more continuous work on these lines, by the remarkable object lesson each departure brings forth to the observer.

My difficulty has been to limit my remarks to a reasonable length, and consequently much has not been touched upon which could profitably be enlarged. I will be glad to reply to any question to the best of my ability.

THE PRESIDENT: What strength did you use the lime-sulphur?

DR. RIGGS: As strong as we could get it through the nozzle, but on the tender foliage about 35 or 40 to 1. When once the sap is getting out of the leaves you can put on as strong a spray as you can get through the nozzle. That can be in July or August, late in the season, 100 sulphur to 50 of lime is our ordinary mixture, and we put in water at the rate of five or six to one and we have no burning.

We had about 10 to 20 trees that were badly infested with San Jose Scale. The owner of the trees told us that he did not care what he did with them, we could destroy them or we could cut them down or do anything we liked; so we came to the conclusion that we had better kill them with kindness. We found they did not appear to suffer, and we applied some more. We were down in the Niagara district and we kept at it, and we found no indication of the scale on our fruit.

We tried 100 sulphur and 100 lime, and we found that we simply had more sludge to handle. Our trees were inspected by both Dominion and Provincial Inspectors, and they said that our trees certainly looked like rough cast houses, but when they had wiped the lime off they found no burning of the foliage.

THE PRESIDENT: Were your results any better than those who applied 1 to 35.

DR. RIGGS: Yes. At first they looked very bad, but this lime-sulphur seemed to bring out a better color, and after it had washed off some they looked very well.

THE PRESIDENT: You think you got better results by applying 1 to 6 in August or July than by using 1 to 35?

DR. RIGGS: We were after the San Jose Scale and 1 to 35 would have been no good; we needed a strong solution. We applied it broadcast, and it did not do any harm to the apples, and we know they came out with a better color.

A MEMBER: Have you used commercial lime-sulphur?

DR. RIGGS: I believe we had two barrels. I do not know what the strength of commercial lime-sulphur is, I have no objection to it; I would not hesitate at all to put it on my trees. I would venture just the same as I would in winter any time after July.

A MEMBER: Have you any record of the specific gravity?

DR. RIGGS: My superintendent did the testing. I never took the tests myself.

A MEMBER: What did the hydrometer read on his tests.

DR. RIGGS: Mr. Thomson can tell you better than I can.

MR. THOMSON: I cannot say about the August spray: I was up after it had been sprayed, before it came into bloom, and it turned out to be the best orchard they had. As far as the strength of it is concerned, making it as they make it, 112 pounds of sulphur to 60 pounds of lime boiled to make a barrel of concentrated spray; when it has settled the clear liquid shows a specific gravity of .24. Do not get that confused with the concentrated; if you were taking Beaume it would be .28: as a rule what you get from the concentrated commercial is Beaume, .32, and in specific gravity would be hardly .28, so a specific gravity

of .24 would be a good deal higher than Beaume. Until the time when the leaves come out fairly well I think a barrel should be diluted to make six; there has never been a case known of any tree being injured at that stage where it has been sprayed at that strength. We did not care for looks, we have to spray to keep our trees and to keep the San Jose scale out of the orchard.

A MEMBER: It is a well known fact that if the commercial lime sulphur is used any stronger than 1 to 35 it will burn the foliage, and if we used it at the strength at which we use it in the winter we would certainly have burning. I do not think this should be allowed to go at this stage, because some people might be under a wrong impression.

DR. RIGGS: You will readily understand that I am only referring to fall spraying. I am giving you what we applied, 100 pounds of sulphur and 50 pounds of lime, and it produced the result that we wanted to attain. If we could spray our trees in midsummer when you find the scale present in that way, then you might be afraid of losing your fruit. I lost a good deal of fruit this year by not knowing what I knew later. If I had known in time I would have had my fruit sprayed with the strong solution.

A MEMBER: How many barrels did you make?

DR. RIGGS: It depends upon what time you use it. In August we used 7 to 1. It adds to the selling qualities of your fruit; as far as testing it for keeping qualities it is almost impossible to give you an idea of that. I kept some in a warm place and it merely shrivelled; it did not rot.

We used arsenate of lead for the bud moth. I would put it on later only this spray being so heavy gets on the fruit.

A MEMBER: What difference was there when you sprayed with the weaker solution; what difference was there in the color of the fruit?

DR. RIGGS: We found it a much deeeper color; the more we put on the better color we found, and if we spray the trees again I would certainly put it on for that effect. It certainly discourages all kinds of pests.

A MEMBER: Did you spray anything else?

DR. RIGGS: I sprayed pears as well, and there was no burning effect.

A MEMBER: I have sprayed pears and plums 1 to 35 and there was some burning.

DR. RIGGS: The foliage must be fully developed; until then you have very tender shoots and I would expect burning. I would not advise any one to use that until the foliage had got fully developed.

MR. THOMPSON: Apples can stand a stronger strength than pears or peaches. I am not prepared to say that you could put it on them at the strength the doctor says. I think you could possibly try some that way; do not spray them all that way. We have now this actual statement that it does not burn. When we were spraying our trees he said that we could use it a good deal stronger than we did; we used it about as high as one to 20 or 25, and we have the statement that the later spray might be a good deal stronger. I would not like to try it except on a few trees to see. At a later stage of the foliage, if the foliage were healthy it would stand a stronger solution.

DR. RIGGS: I may say that I know of one orchard that was sprayed with commercial lime-sulphur; I noticed that it was put on fully winter strength right in the blossoms and it had burned the leaves, but the apples matured and they had lots of apples in the orchard though it had burned the leaves.

A MEMBER: We used it as strong as 1 to 17 just immediately after the blossoms had fallen but I would be afraid to recommend using that strength.

DR. RIGGS: Not at that time.

THE PRESIDENT: The doctor has been opening up a new line of thought, something that will be greatly interesting to us, and perhaps next season we will give it a trial.

The next item on the programme is the Dominion Conference of Fruit Growers, which as you know was suggested by the Department of Agriculture at Ottawa. About five years ago we had a similar meeting and representatives from the various provinces met there and discussed very important questions, and we believe we can bring about a certain amount of legislation. It is proposed to hold this Dominion Conference some time in February. There are a great many questions which we would like to see settled at that time, and there are a great many things which should be taken up at that conference, and we should discuss them here freely this afternoon.

CHANGES IN CO-OPERATIVE METHODS.

JAMES E. JOHNSON, SIMCOE.

I do not know how my name came to be attached to this subject otherwise than I had a talk with Mr. Hodgetts our secretary, and secured from him some suggestions as to how co-operation could be benefited at the present time. I offered a few suggestions to him, and for that reason my name was placed on the programme at the present time.

As probably you all well know, I had the management of an association since 1906. We started in with 17 members, and at the present time we have 535, so you see that our growth has been exceedingly large.

The problem that we are face to face with to-day is as to how this can be benefited. I am free to say that I believe that our association has grown faster than our educational work has, and I believe education to be the first and most important thing before you can start an association properly. You can see by going through the St. Lawrence arena that the educational work has not been carried on, and you will find that many of these exhibits have been aided by these co-operative associations and it seems to me that there should be re-organization in the case of a great many of these associations in the Province of Ontario. I am only here to start the discussion, and if any of you can offer any suggestions I am sure we will be only too glad to have them.

The first thing is what constitutes a first-class working member? What should that member be? You see how we have grown in the past few years, but when we first started, we used to go round and coax them in: and we did this the next year also, and I may say that in the past two years we have not done that at all, but still we have been growing very rapidly. Any member who would come and say he wanted to join our association we would take in. We have been taking them in that way, and I believe—in fact I can say—that we have members who are not beneficial from lack of education. It is education along these fruit lines that they are lacking, and that is something that every member of every association ought to have.

Now, there are many ways in which this rule is departed from. In the first place I may say that when we started our association we found that we were going to encounter some little opposition. The apple buyers went around and they certainly did all they could to discourage the members from joining our association. They tried to induce them not to sell their apples through the association. But I believe now that you will find a number of apple buyers through the Province of Ontario who will say that the association has been a great benefit to the trade throughout the Province. The growers themselves can pick these apples cheaper than the buyers can. We probably have some who own orchards and who are not in the association who are doing all they can in some underhand way to hurt the association by starting some unfounded rumor. I may say to them that the associations are a great benefit.

Why are the associations a benefit to them? Because the association undoubtedly benefits those who are in it, and whatever benefits those who are members of the association also benefits those who are outside the association. I am only too glad to impart any information that I have to the members of the association, as well as to any that feel the need of information along the lines of its work.

In the purchase of spraying materials we have a certain line of merchants who trade with our association, and they likewise sell to our association. Before the starting of our association in Norfolk county, I venture to say that probably they never saw it in carload lots and probably one barrel would supply our county prior to 1906. I say this to the merchants that they are benefited also by this association for if our work is carried on properly that our growers will receive more money to spend and our merchants will be benefited in that way.

Our members are in need of educational work, and the question is how are we going to get it. Our Department of Agriculture has been doing a great deal of good, and I believe they can do a great deal more, and we should feel encouraged by what has already been done to go on still further, and to give greater assistance in the way of educational work than we have hitherto done.

The kind of members we want are the ones who will live up strictly to the rules, who will at all times stand back of the association and be loyal to it, and this is what is needed in all the associations in the Province of Ontario. The question is how can we deal with these harmful reports which may be sent out and are harmful to our associations. I believe that every association should have an investigating committee to investigate any stories that may be sent out, and report on them. Perhaps some of you may think that this would be a great deal of work, but I believe you will find out that the investigating committee will not have as much to do as you would think, for I believe that you would find that fewer of these reports would be spread around, if it was known that they would be thoroughly investigated. You will find that it is much easier to tear down the good work of an association than it is to build it up, and that is a matter that each one of us should consider. Co-operation, I understand, has been carried on successfully in Europe, particularly in England, Scotland, Denmark, and Germany, and would it not be well for our Government to send a man there, not for a month or two months, but for six months to study their co-operative methods, say, such a man as our secretary, who would go there for that length of time and grasp their ideas, to spend six months between now and the time of our next

annual meeting, and be here to take up a whole session to give us the results of his trip. I believe it would be of great interest to us as fruit growers in this Province of Ontario.

I wish to say a word of warning to those of you who are thinking of starting associations. Don't try to get your association too large. You can be sure of real growth if only those join who are deserving members. Avoid those who are not likely to recognize what the rules are, or who do not appreciate the fact that it is a business that they are carrying on. I think, too, that we do not meet nearly often enough. I find that many of the associations in the old country meet every fortnight, and I believe that it would be a great benefit for our members to get together and discuss these things far oftener than they do at present. Don't try to build up a large association too quickly. I believe it would be better to have a small association, and for one salesman to go out selling for several of the small associations, than it is to have a large association with a salesman. You all know that the varieties in different sections vary; in some parts of our county we have quite a lot of men who have what we would term undesirable varieties. If this association was divided these small orchards could be sold to some buyer according to the varieties which they had there to sell, and at the present time, in order to get any satisfaction at all, it practically means that we have to sell our fruit in a lump. I approve of the smaller associations.

RESOLUTIONS.

The following resolutions were submitted, discussed and carried:

(1) "That a committee of this association be appointed to procure the latest information in regard to the best methods of packages, and that the result be reported to the Board of Directors of this Association and the recommendation of the Board be published."

(2) "That the Ontario Government be requested to provide a short course at the Ontario Agricultural College at Guelph, for fruit inspectors and fruit packers, and in the counties, as far as practicable, a similar short course for fruit packers, granting certificates for each. Also to extend the work of county instructors which is resulting in great benefit wherever in operation, to other counties until the whole province is covered."

(3) "That the railway companies be interviewed by the Transportation Committee, requesting them to improve all refrigerator cars that are old and defective, as many cars are very inefficient as refrigerators on account of the doors not being tight.

"Also provide at Port Arthur, Fort William and Westport suitable accommodation, to protect apples from frost when unloaded from the boats until refrigerator cars are provided, in freezing weather, and that the railway companies be asked to guarantee refrigerators there, and not as now refuse to guarantee any protection after November 1st."

(4) "That the Ontario Government be requested to send a capable man to Europe to study co-operative methods amongst agriculturists, and to make an exhaustive study of market conditions of fruit and report to the Government."

(5) "That the Dominion Government be requested to have daily market prices of fruit by cable from all trade agents in large centres in Europe, and published in leading daily papers in fruit growing provinces."

(6) "That this Association in convention urge upon the Canadian Minister of Agriculture, to appoint a commission composed of fruit growers or dealers in each of the fruit growing provinces well known for their knowledge and experience in the fruit business, whose duty it shall be to examine and recommend for appointment fruit inspectors and instructors."

(7) "That the Dominion Government be requested to have the forms on which legalized sizes of fruit baskets are made issued to the manufacturers, so that all shall be of uniform shape and size."

(8) "That the Association endorse the recommendations of Prof. Caesar regarding the appointment of inspectors under the Fruit Pests' Act, and that a copy of his recommendations and this resolution be forwarded to the Minister of Agriculture; and that a committee of five be appointed by this association to confer with the Minister upon the details, the following to be the committee: Messrs. E. D. Smith, R. Thompson, A. Onslow, E. E. Adams, of Leamington, and W. Fisher, of Burlington."

(9) "That the Government of Canada be asked to amend the Fruit Marks' Act, so as to establish a minimum size for each grade of apples of each variety and more closely define the grades.

(10) "That the Government of Canada be asked to amend the Inspection and Sales Act so as to provide;—

First, for trained and qualified inspectors in much greater numbers than at present.

Second, that on the request of a packer or shipper a competent inspector be sent to inspect carload lots of apples at point of shipment, and a certificate of the result of such inspection be given to the packer or shipper, stating when and where said car was inspected and stamping each barrel of the carload so inspected."

(11) "That we wish to impress upon the Ontario Government that every effort be made at the fruit experiment station at Jordan, to propagate improved varieties of the various fruits from seedlings obtained by hybridizing, as there is in all plants abundant room for varieties of merit much superior to any that we have. We cannot impress too strongly upon the Department of Agriculture of Ontario the extreme importance of such work, and the great opportunities in it to add to the wealth of the province."

(12) "That this Association wishes to congratulate the Hon. the Premier of this dominion, on his selection of Hon. Martin Burrell as Minister of Agriculture of Canada, believing that no choice could have been made from the members of the house that would have been so satisfactory to the fruit growers of the country, and

trust that this is a recognition, also of the vast and rapidly growing importance of the fruit growing industry, which we hope will receive even greater consideration at the hands of the Government than heretofore. And we also wish to congratulate Mr. Burrell upon his selection as the first commercial fruit grower to occupy what we consider, one of the most important positions in the Cabinet of Canada."

(12) "That the standard pear box be 8 in. x 11 in. x 20 in. inside measurement and that a half box be 4 in. x 11 in. x 20 in., inside measurement."

FULLER FRUIT STATISTICS NECESSARY.

A. W. Peart, Burlington.

The subject for discussion which I am asked to say something about is connected with the forthcoming fruit conference at Ottawa. At the time of the conference in Ottawa in 1906, I prepared, from various sources, a set of figures bearing upon the question of the fruit industry in the Dominion and the various Provinces. My figures at that time were drawn from various sources, and I think were considered by the practical fruit men there to be of some value to the fruit industry in the Dominion and in the Provinces. I wish to say that since that time the value of fruit statistics became of some importance. I know that these figures were used in the Agricultural Colleges both of the Province of Ontario and the Province of Quebec, and I know that public men in addressing meetings when they required to use statistics in reference to the fruit industry used these. I understand that they were the first set of figures that were ever presented in Canada on that subject, and I was as careful with these figures as I could possibly be.

Now, I believe that the thought this meeting is to get some conception of how these figures might be improved upon at the approaching conference. At the last Dominion Conference I moved the following resolution regarding the compiling of statistics.

"That the delegates to this conference from the several provinces petition, their respective governments to collect, classify and publish, henceforth in detail in their annual reports the statistics bearing on fruits."

Now, I am pleased to say that so far as the Government of this Province is concerned it has in a great measure compiled with our request. By comparing the report of 1906 with that of 1909 you will see there is a difference. In the 1906 report there are two columns regarding fruit, one devoted to orchard and the other devoted to grapes. In the last report issued in 1909, which I have received there are four columns, for large fruits, small fruits, vineyard and garden. There is an advance, and I think that advance should be recognized and appreciated by this Association.

At the approaching Dominion Conference I propose if I can get what I consider suitable information, to revise the figures submitted at the last conference. I have written to Mr. Blue asking him to send me a copy of the last census in so far as it relates to the fruit industry, but I got a letter from him that he would not be able to furnish that information for some time yet. In the report submitted then I omitted grapes. Apples, pears, and all the fruits were mentioned and dealt with;

up to that time the grapes were omitted, but after I get a copy of the census of 1911 the grapes are going to be set forth, and I propose to incorporate them with the other statistics in the report to the approaching Dominion Conference.

I wish to submit the following resolution bearing on the statistics of this province.

"That this association appreciates the advance made by the Department of Agriculture in giving in greater detail statistics of the fruit industry of Ontario, as shown by a comparison of those of 1906 and 1910 respectively."

At the present time we have the acreage of the orchard, but we would like to have the acreage of apples alone, and the objects aimed at by this resolution will have the effect of giving us better statistics for fruit industry for the Province of Ontario, and in fact for the Dominion of Canada, and I hope to be able, if the information I need can be procured, to incorporate them in a report for the approaching Dominion Conference.

The resolution above referred to was seconded by Mr. Gilbertson and carried.

THE PRESIDENT: There is just one more subject to discuss and that is the matter of the Provincial Show. I am very much inclined to doubt if Ontario can develop a decent Horticultural Show, it has increased over 100 per cent. better than last season. I think that next year we will put up a display of fruit which will do us a great deal of credit. Mr. Hodgetts is very anxious that you should express yourselves most fully on this matter of a Provincial show.

MR. TODD: I suppose if we got into a National Fruit Show that our fruits would be put in competition with the rest of the Dominion. The question for us to consider is whether we have learned to walk well enough yet to be able to go into competition and run in the race with them. We undoubtedly have the fruit, I think there is no question of that, and I think it is merely a matter of packing. Have we mastered that sufficiently to go into it and compete with the rest? Shall we make it a Provincial show or would it be better to have a national show? If the latter is not possible, would it be wise, then, to disturb the development of our Provincial show unless the national show would become an annual affair. I am afraid that I am not sufficiently familiar with that question to be able to answer that intelligently, and I suppose these are the questions that are before us.

MR. HAMILTON: I am not very much inclined to support it. We are doing very well as we are now, and the conditions under which we are growing fruit are so dissimilar from the conditions under which fruit is grown in other parts of the Dominion, and there is always the danger that the public will be carried away rather by color than by quality. I do not believe specially in regard to winter apples that they are in it with us with regard to the quality; but fitness is not so easily apparent to the general public, and I am just afraid that perhaps we might not do as well as we should like if we were brought into sharp competition with the fruits that are grown on the Pacific coast. We are doing so well developing this industry in Ontario that we hardly have the time to give attention to a national show.

If you go into the national show and have one next year, I think you will find that the people on the western coast will see that this show is a peripatetic thing and that it should travel about the different parts of the Dominion. I think it is plain that we should go on as we are; we are doing very well. We should keep on growing until we develop into full manhood, and I believe that the time is soon coming when we will be able to hold our own, and more than our own, in competition with the apple growing industry in the rest of the Dominion and the western coast.

MR. THOMPSON: I cannot quite agree with Mr. Hamilton that we cannot compete with them. It is a good deal different from fruit growers competing in an association. Many a one comes to an association, and the second or third prize is not worth much more than the apples. You cannot hope to get apple growers here in Ontario to select a lot of apples and send them out like that. Have we the means necessary to float a big national show? I do not think we have.

We are improving and we want to keep on. We want to urge our directors of the National Exhibition in September, to treat us better. If our association would pay a little more attention to this, and possibly put up a little more money, we will have a show here in Ontario that will equal any national show that could be held anywhere else. If we could look forward to that being made an annual event here, and improved year after year, I think we might do a very great deal for the fruit industry in Ontario, and a good deal more than we could possibly do by having a national show.

MR. HODGETTS: I wanted this matter brought up this afternoon. Our friends in British Columbia have written wanting to know what we are going to do. My idea is to proceed along present lines, and see what can be done with our Canadian National Exhibition. You can readily understand that there is plenty of room for us to grow. I believe that we are making very good progress, and there is certainly a remarkable improvement over our show of eight years ago, which you remember was held in the Granite Rink. If we can get an increased grant from the Provincial Government—and I think that the time is ripe now that they will be ready to help us out—I have no doubt that we can get together just as creditable a display of apples as they can at Vancouver or anywhere else, and I see no reason why it should not be an annual matter and of great importance to fruit growers. I do not see any reason why we cannot go ahead and have just as big a show as they had out there last year, and have it every year, and have far more satisfactory financial conditions than they had at Denver or at Spokane.

MR. CASTON: I believe we are making such satisfactory progress that I think we ought to be content to go on as we are doing now. We ought to make an exhibit in the section where we expect to sell our goods, such as the Old Country. I think it would be very desirable that we should make a fine exhibit of all we produce in Ontario in the section where we propose to sell our goods.

THE PRESIDENT: I think the general feeling is that we shall not have a National Apple Show, but instead that we shall go on and develop our Provincial Show until we make ourselves famous. Then it is just possible that we cannot pack our fruit just as nicely as our British Columbia friends do. Their fruit was quite attractive, and the whole thing was excellently got up.

PRIZE LIST AT ONTARIO HORTICULTURAL EXHIBITION, 1911.

APPLES.

Export Varieties.—Barrels Ready for Shipment.

Baldwin: 1st, Jas. E. Johnson & Bros., Simcoe; 2nd, J. D. Remmer, Pickering; 3rd, Norfolk F. G. A., Simcoe.

Ben Davis: 1st, J. O. Duke, Ruthven; 2nd, Sidney Trevail, Taunton; 3rd, Wm. Dyer, Columbus.

Golden Russet: 1st, F. M. Lewis, Brant Fruit Growers' Association, Burford; 2nd, W. B. Guy, Oshawa; 3rd, Isaac Huggins, Oshawa.

Greening (R. I.): 1st, R. T. Michael, Brooklin; 2nd, Jas. E. Johnson & Bros.; 3rd, Isaac Huggins.

King: 1st, Jas. E. Johnson & Bros.; 2nd, Norfolk F. G. A.; 3rd, M. Crawforth, Whitby.

Spy: 1st, Norfolk F. G. A.; 2nd, P. C. Dempsey, Trenton; 3rd, F. M. Lewis, Burford.

Stark: 1st, W. H. Stainton, Oshawa; 2nd, Geo. R. Hare, Grafton.

Any other variety: 1st, Jas. E. Johnson & Bros.; 2nd, Norfolk F. G. A.; 3rd, Isaac Rush, Norwich.

Export Varieties.—Boxes Ready for Shipment.—(*Fruit unwrapped.*)

Alexander: 1st, W. G. Watson, Dixie; 2nd, P. C. Dempsey.

Baldwin: 1st, Jas. E. Johnson & Bros.; 2nd, R. Thompson, St. Catharines; 3rd, W. H. Bunting, St. Catharines.

Cranberry: 1st, Wm. Dyer; 2nd, P. C. Dempsey.

Fameuse: 1st, W. G. Watson, Dixie; 2nd, W. H. Dempey; 3rd, Geo. Goring, St. Catharines.

Golden Russet: 1st, W. L. Hamilton, Collingwood; 2nd, R. Stork, Columbus; 3rd, Isaac Huggins.

Greening (R. I.): 1st, W. L. Hamilton; 2nd, W. H. Bunting; 3rd, Isaac Huggins.

King: 1st, Norfolk F. G. A.; 2nd, Jas. E. Johnson & Bros.; 3rd, Wentworth F. G. A., Hamilton.

McIntosh: 1st, W. G. Watson; 2nd, Jos. Baker, Whitby; 3rd, W. G. Robertson, Iroquois.

Spy: 1st, Jas. E. Johnson & Bros.; 2nd, R. Stork; 3rd, Thos. Stainton.

Export Varieties.—Boxes Ready for Shipment.—(*Fruit wrapped.*)

Fameuse: 1st, W. G. Watson; 2nd, W. H. Bunting; 3rd, J. B. Guthrey, Dixie.

Gravenstein: 1st, W. H. Stevenson, Oshawa; 2nd, Elmer Lick, Oshawa; 3rd, S. Snowden, Bowmanville.

King: 1st, Wentworth F. G. A.; 2nd, W. H. Bunting; 3rd, W. G. Watson.

McIntosh: 1st, W. G. Watson; 2nd, Jos. Baker; 3rd, The Biggs Fruit & Produce Co., Burlington.

Spy: 1st, Norfolk F. G. A.; 2nd, W. G. Watson; 3rd, Wentworth F. G. A.

Wealthy: 1st, W. G. Watson; 2nd, J. B. Guthrey; 3rd, W. H. Stevenson.

Domestic Varieties.—Barrels Ready for Shipment.

Blenheim: 1st, R. W. Grierson, Oshawa.

Gravenstein: 1st, Elmer Lick.

Ontario: 1st, P. C. Dempsey; 2nd, John Watson, Seagrave.

Tolman: 1st, W. H. Westney, Pickering; 2nd, G. B. Mothersill, Oshawa; 3rd, Wentworth F. G. A.

Roxbury Russet: 1st, Isaac Rush.

Any other variety: 1st, Norfolk F. G. A.; 2nd, Jas. E. Johnson & Bros.; 3rd, B. J. Palmer, New Durham.

Domestic Varieties.—Boxes Ready for Shipment.—(*Fruit unwrapped.*)

Baxter: 1st, Isaac Huggins.

Blenheim: 1st, W. G. Watson; 2nd, F. W. Dawson, Brampton.

Gravenstein: 1st, S. Snowden; 2nd, Elmer Lick; 3rd, D. Whyte, Bendale.

Ontario: 1st, W. G. Watson; 2nd, John Watson; 3rd, Wm. Dyer.

Ribston: 1st, W. L. Hamilton; 2nd, Geo. Bannister, Collingwood; 3rd, W. G. Watson.

St. Lawrence: 1st, W. G. Watson; 2nd, E. Lick.

Wolf River: 1st, Isaac Huggins; 2nd, C. L. Stephens, Orillia.

Any other variety: 1st, Norfolk F. G. A.; 2nd, Jas. E. Johnson & Bros.; 3rd, Geo. Goring.

STANDARD WINTER VARIETIES.—5 BOXES OF EACH.

Baldwin: 1st, Wentworth F. G. A.; 2nd, Norfolk F. G. A.
Greening: 1st, F. G. Stewart; 2nd, Norfolk F. G. A.
Spy: 1st, Norfolk F. G. A.; 2nd, W. F. Bradley, Georgetown.

STANDARD WINTER VATIETIES.—10 BOXES OF EACH.—(*Fruit wrapped.*)

Fameuse: 1st, F. W. Dawson.
McIntosh: 1st, J. G. Michael.
Spy: 1st, W. H. Stainton; 2nd, Lawson & Fairhead, Blenheim.

STANDARD WINTER VARIETIES.—20 BOXES.—(*Fruit unwrapped.*)

Spy: J. D. Remmer, Pickering; 2nd, Milton Fruit Growers' Association, Milton.

BEST BOX APPLES ON EXHIBITION IN ANY SECTION.

James E. Johnson & Bros., with box of Spy.

DESSERT VARIETIES.—PLATES OF FIVE.

Fameuse: 1st, W. H. Bunting; 2nd, Geo. Goring; 3rd, W. L. Hamilton.
Golden Russet: 1st, W. H. Watson; 2nd, J. B. Guthrey; 3rd, Isaac Huggins.
Gravenstein: 1st, R. R. Waddle; 2nd, Wentworth F. G. A.; 3rd, W. H. Stevenson.
King: 1st, W. L. Hamilton; 2nd, W. G. Watson; 3rd, Jas. E. Johnson & Bros.
McIntosh: 1st, W. G. Watson; 2nd, The Biggs Fruit & Produce Co.; 3rd, W. L. Hamilton.
Wealthy: 1st, John D. McDonald, Cornwall; 2nd, W. G. Watson; 3rd, J. B. Guthrey.
Spy: 1st, W. L. Hamilton; 2nd, Norfolk F. G. A.; 3rd, V. G. Hector, Erindale.
Spitzenburg: 1st, Norfolk F. G. A.; 2nd, Wentworth F. G. A.; 3rd, Jas. E. Johnson & Bros.
Any other variety: 1st, W. G. Watson; 2nd, Lawson & Fairhead; 3rd, W. G. Watson.

COOKING VARIETIES.—PLATES OF FIVE.

Alexander: 1st, W. G. Watson; 2nd, John D. McDonald; 3rd, P. C. Dempsey.
Baldwin: 1st, Wentworth F. G. A.; 2nd, Cared For Fruit Co., Toronto; 3rd, Jos. Picket, Dixie.
Blenheim: 1st, W. G. Watson; 2nd, J. B. Guthrey; 3rd, J. G. Brown, Humber Bay.
Cayuga: 1st, R. Thompson; 2nd, F. M. Lewis, Brant Fruit Growers.
Greening (R. I.): 1st, W. L. Hamilton; 2nd, F. G. Stewart, Homer; 3rd, R. Thompson.
King: 1st, Norfolk F. G. A.; 2nd, Jas. E. Johnson & Bros.; 3rd, P. A. Fisher, Burlington.
Ribston: 1st, W. G. Watson; 2nd, W. L. Hamilton; 3rd, E. W. Moyle, Langstaff.
Spy: 1st, W. L. Hamilton; V. G. Hector; 3rd, W. G. Watson.
Any other variety: 1st, J. O. Duke; 2nd, John D. McDonald; 3rd, V. G. Hector.

STANDARD WINTER VARIETIES.—10 PLATES OF 5 SPECIMENS EACH.

Baldwin: 1st, R. Thompson; 2nd, Wentworth F. G. A.; 3rd, W. G. Watson.
Greening: 1st, F. G. Stewart; 2nd, Geo. Goring; 3rd, W. H. Bunting.
King: 1st, Norfolk F. G. A.; 2nd, W. F. Watson; 3rd, Wentworth F. G. A.
Spy: 1st, W. F. Watson; 2nd, J. B. Guthrey; 3rd, V. G. Hector.

CONES OF FRUIT.

Ben Davis: 1st, Sidney Trevail; 2nd, W. L. Hamilton; 3rd, Wm. Dyer.
Baldwin: 1st, W. G. Watson; 2nd, P. C. Dempsey; 3rd, P. A. Fisher.
Blenheim: 1st, W. G. Watson; 2nd, R. W. Grierson; 3rd, J. G. Brown.
Gravenstein: 1st, J. B. Guthrey; 2nd, D. Whyte; 3rd, E. Lick.
Fallawater: 1st, W. G. Watson; 2nd, W. H. Stevenson; 3rd, P. C. Dempsey.
Fameuse: 1st, W. G. Watson; 2nd, F. M. Lewis, Brant F. G. A.; 3rd, J. B. Guthrey.
King: 1st, W. G. Watson; 2nd, F. M. Lewis, Brant F. G. A.; 3rd, Hugh Pugh, Whitevale.
McIntosh: 1st, W. G. Watson; 2nd, W. G. Robertson; 3rd, Jos. Baker.
Ontario: 1st, W. G. Watson; 2nd, W. H. Westney; 3rd, Wm. Dyer.
Spy: 1st, W. G. Watson; 2nd, J. B. Guthrey; 3rd, Isaac Rush.
Wolf River: 1st, John D. McDonald; 2nd, D. Whyte; 3rd, Isaac Huggins.

PEARS.—Plates of Five.

Anjou: J. B. Guthrey; 2nd, R. Thompson.
Bosc: 1st, P. A. Fisher.
Clairgeau: 1st, Alex. Glass, St. Catharines; 2nd, J. B. Guthrey.
Duchess: 1st, C. F. Holcroft, Oakville; 2nd, F. G. Stewart.
Kieffer: 1st, Geo. Goring; 2nd, Alex. Glass.
Lawrence: 1st, Alex. Glass.
Winter Nelis: 1st, Alex. Glass; 2nd, P. A. Fisher.
Any other variety: 1st, W. M. Robson, Lindsay; 2nd, F. G. Stewart.

Export Varieties.—Boxes Ready for Shipment.—(*Fruit wrapped.*)

Anjou: 1st, G. A. Robertson; 2nd, F. G. Stewart; 3rd, R. Thompson.
Clairgeau: 1st, J. B. Guthrey.
Duchess: 1st, G. A. Robertson; 2nd, F. G. Stewart; 3rd, R. Thompson.
Kieffer: 1st, F. G. Stewart; 2nd, R. Thompson; 3rd, W. H. Bunting.
Lawrence: 1st, F G. Stewart; 2nd, R. Thompson.

GRAPES.

Agawam (3 bunches): 1st, R. Thompson; 2nd, F. G. Stewart.
Concord (3 bunches): 1st, F. G. Stewart; 2nd, R. Thompson.
Lindley (3 bunches): 1st, F. G. Stewart; 2nd, R. Thompson.
Niagara (3 bunches): 1st, Geo. Goring; 2nd, W. H. Bunting.
Vergennes (3 bunches): 1st, R. Thompson; 2nd, W. H. Bunting.
Wilder: 1st, R. Thompson; 2nd, Geo. Goring.
Any other desirable variety: 1st, W. H. Bunting; 2nd, R. Thompson.
Black Grapes (9 lb. basket): 1st, Geo. Goring; 2nd, R. Thompson.
Red Grapes (9 lb. basket): 1st, Geo. Goring; 2nd, R. Thompson.
White Grapes (9 lb. basket): 1st, W. H. Bunting; 2nd, F. G. Stewart.
Black Grapes (fancy package): 1st, R. Thompson; 2nd, F. G. Stewart.
Red Grapes (fancy package): 1st, F. G. Stewart; 2nd, R. Thompson.
White Grapes (fancy package): 1st, R. Thompson; 2nd, F. G. Stewart.

COLLECTIONS.

Exhibits of fruits in commercial packages (60 sq. ft.): 1st, R. Thompson; 2nd, F. G. Stewart.
Display of apples, not in commercial packages (60 sq. ft.): 1st, W. G. Watson.

Box or Barrel Brands.

1st, W. H. Stevenson; 2nd, Norfolk F.G.A.; 3rd, Oshawa F.G.A.

PACKING.

Commercial package, unwrapped apples, any variety, 75% to be given for package, grading and packing and 25% for variety and quality of fruit. All entries must grade No. 1, according to the Inspection and Sales Act: 1st, *R. Thompson; 2nd, Wentworth* F.G.A.
Commercial package, wrapped apples, any variety, 75% to be given for package, grading and packing, and 25% for variety and quality of fruits. All entries must grade No. 1, according to the Inspection and Sales Act: 1st, R. Thompson; 2nd, Wentworth F.G.A.

SPECIMEN APPLES OF STANDARD VARIETIES.

Baldwin: 1st, Norfolk F.G.A.; 2nd, R. R. Waddle, Hamilton.
Fameuse: 1st, W. G. Watson, Dixie; 2nd, R. R. Waddle, Hamilton.
Greening (R.I.): 1st, F. G. Stewart, Homer; 2nd, G. A. Robertson, St. Catharines.
King: 1st, P. C. Dempsey, Trenton; 2nd, Norfolk F.G.A.
McIntosh Red: 1st, Biggs Fruit & Produce Co., Burlington; 2nd, L. A. Parisien, Summertown.
Spy: 1st, W. F. Bradley, Georgetown; 2nd, W. G. Watson.
Wolf River: 1st, D. Whyte, Bendale; 2nd, John D. McDonald, Cornwall.

REPORT

OF

FRUIT BRANCH

Department of Agriculture

ONTARIO

1911

Published by the Ontario Department of Agriculture, Toronto

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:

Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty

1912

Printed by
WILLIAM BRIGGS
29-37 Richmond Street West
TORONTO

Report of the Fruit Branch

1911

Owing to the publication of a separate report by the Minister of Agriculture on the work of the entire Department during the year, the general review of the lines undertaken by the Fruit Branch is now embodied in the above report. The separate report heretofore published by the Fruit Branch will, accordingly, be discontinued. All material of value relating to the experimental or cultural work with the various fruits is now being published in bulletin form with the idea of giving it wider circulation. The Department plans to have in print complete information on all fruits which will be kept revised from year to year as the demand warrants.

The amounts of money voted by the Legislature for the season's operations of the Fruit Branch in 1911 are given below and show very briefly the main lines of work undertaken. In addition, the orchard survey work was continued, the expenses being charged to the general vote of the Assembly for agricultural investigations.

Grants to Associations	$ 3,500.00
Ontario Horticultural Exhibition	2,000.00
Orchard demonstrations in pruning, spraying, box packing, etc.	8,000.00
Inspection of apiaries	3,000.00
Exhibitions, cold storage	5,000.00
Horticultural Experiment Stations, salaries, etc.	16,100.00
Horticultural Experiment Station, pumping plant, fruit house, etc.	4,330.00
Expenses of Experiment Stations, etc.	2,000.00
Inspection of nurseries and orchards	5,000.00
Salaries	3,420.00
Contingencies	1,500.00

Your obedient servant,

P. W. Hodgetts, *Director.*

SEVENTH ANNUAL REPORT

OF THE

ONTARIO
Vegetable Growers' Association

1911

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty
1912.

Printed by
WILLIAM BRIGGS,
29-37 Richmond Street West,
TORONTO.

To His Honour Sir John Morison Gibson, Knight Commander of Our Most Distinguished Order of St. Michael and St. George, a Colonel in Our Militia of Canada, etc., etc., etc., *Lieutenant-Governor of the Province of Ontario.*

May it Please Your Honour:

I herewith present for consideration of your Honour the Annual Report of the Ontario Vegetable Growers' Association for 1911.

Respectfully yours,

J. S. DUFF,

Minister of Agriculture.

Toronto, 1912.

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Ontario Vegetable Growers' Association

OFFICERS AND DIRECTORS, 1912

President: Thos. Delworth, Weston.

First Vice-President: C. W. Baker, Tamblings.

Second Vice-President: W. J. Kerr, Woodroffe.

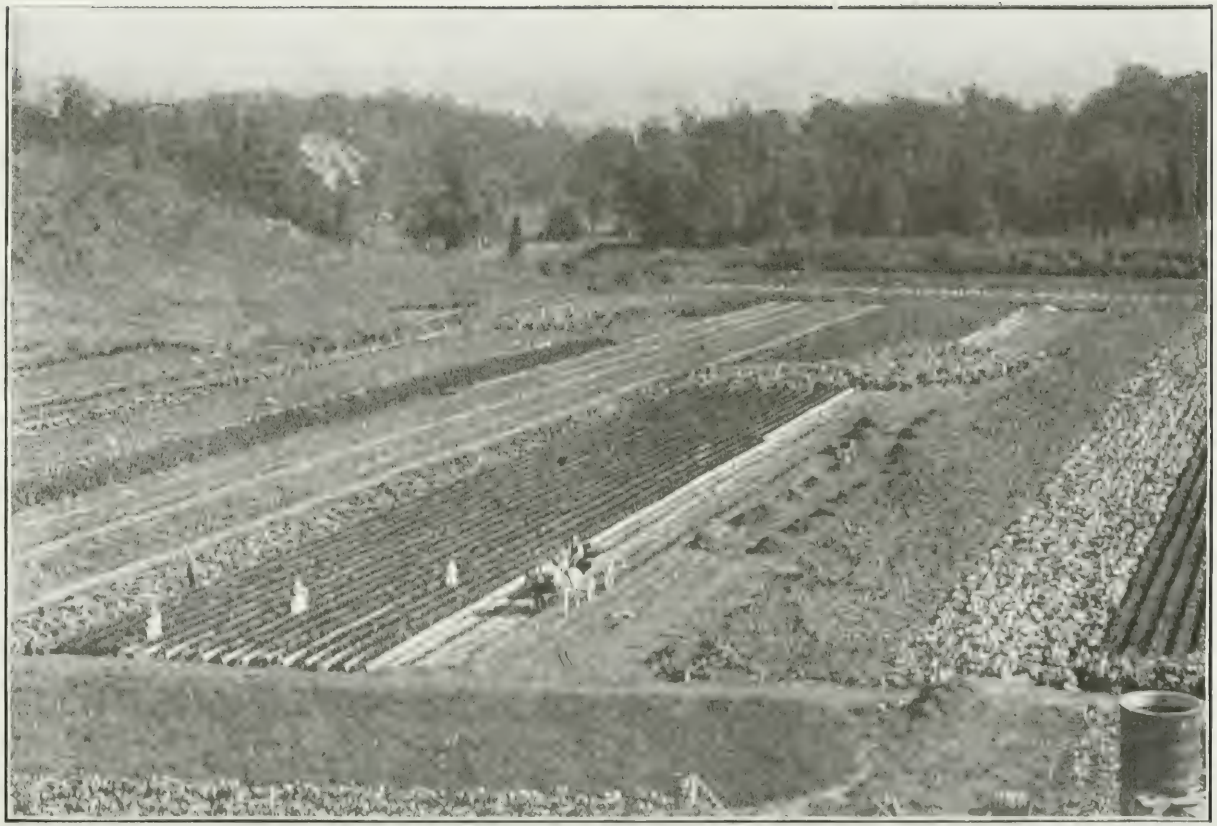
Secretary-Treasurer and Editor: J. Lockie Wilson, Toronto.

Directors: D. J. Lamb, St. Thomas; L. E. Sprague, Dexter; H. Shipley, Union; H. Seager, Stratford; H. Hachborn, Brantford; S. S. Davidson, Brantford; W. Hull, Billing's Bridge; Denis Rocheleau, Tecumseh; Francis R. Jolie, Ojibwa; J. W. Brough, Picton; W. R. Vroman, Woodstock; C. H. Weaver, Dunnville; E. K. Purdy, Kingston; R. Dengate, London; G. W. Bycroft, London; Geo. Elvins, Belleville; F. F. Reeves, Humber Bay; W. D. Ferguson, Sarnia.

Executive: Thos. Delworth, Weston; C. W. Baker, Tamblings; J. Lockie Wilson, Toronto; F. F. Reeves, Humber Bay; C. H. Weaver, Dunnville; W. J. Kerr, Woodroffe.

Representative to Canadian National: Jas. Dandridge, Humber Bay.

Representatives to Horticultural Exhibition: W. J. Rush, F. F. Reeves, T. Delworth and Jas. Dandridge.



A Well-kept Market Garden.

Ontario Vegetable Growers' Association

SEVENTH ANNUAL CONVENTION.

The seventh annual convention of the Ontario Vegetable Growers' Association was held at the City Hall, Toronto, on Wednesday, November 15th, 1911, with the President, Thos. Delworth, in the chair. This was the largest convention yet held by this organization and at each session there was a full attendance of delegates.

PRESIDENT'S ADDRESS.

T. Delworth, Weston.

I welcome you to the seventh annual convention of the Ontario Vegetable Growers' Association. Our organization has been increasing in size and interest from year to year, and we trust it has been increasing in usefulness. While I may congratulate you on this being a fairly successful year for vegetable growers throughout this Province, there has been one notable exception, and that was a very serious drouth we had during the early part of the season, and throughout June and July which, naturally, brings me to the question of irrigation. Every progressive vegetable grower, at least in this Province, who wishes to make a success of his business must seriously consider installing some system of irrigation. The past two or three seasons in this country have amply demonstrated that fact. In considering this matter—and I have had it in my mind for some time past—there are three points to be recognized. The first is the question of supply, and whatever else you have you must have abundance of water at low cost. I tried a great many different ways to get that; local conditions must be considered, but water is the first thing you must have. The second is a pipe line to carry it at a moderate cost. In looking over the work that has been done and is being done in developing the Hydro-Electric System in this Province, many of the market gardeners of Ontario are very fortunately situated in that respect. The abundant supply of power that will be placed at our disposal at low cost will settle that point for us. The next is the method of distribution. Those of you who attended our Convention last year or who received our last Annual Report, know of the exhibit by Mr. Coles, representing the Skinner Irrigation Company. We have representatives here to-day who have installed portions of this in their gardens, and have found it very satisfactory. As I said at the outset, some system of irrigation is certainly necessary in this climate if a man is going to make the success of his business which he should.

The next serious problem is the question of marketing. The press has been full lately of the question of eliminating the middleman. The large difference between the price received by the producer and the cost to the consumer, of farm and garden produce, both in this country and with our neighbors to the south of us, is occupying the minds of very many of our thinkers, and our newspaper editors. We have with us to-day Paul Work, of the staff of Cornell University, who has given some study to this question and he will give us an address on this subject this evening. We need not enlarge further on that till we hear Mr. Work's address, and, no doubt, the discussion that will follow will bring out a great many

different points that will be of value to us in assisting us in the marketing of our produce. It is not a question that affects ourselves alone, but the whole community. We think the producer should receive a larger share of the value of his products, and the consumer in a great many cases is paying too much, when we take into consideration the small price that is being received by the producer.

Another question is that of Seeds. A leading authority on the question of seeds on this continent, Dr. W. W. Tracey, of the Department of Agriculture, Washington, will give us a talk on the question of good seeds for vegetable growers. I heard him some time ago at Ashtabula, Ohio, at the Vegetable Growers' Association there and I was delighted with his address. This is a question in which the Ontario Vegetable Growers' Association have taken an active part. I need not go over our work of two or three years ago in regard to the legislation that was obtained in that respect; then there is the experiment we are carrying on this year in regard to seed potatoes. Some of you are acquainted with the work we accomplished in 1910. This year we have had grown for us for seed purposes potatoes at a number of points in Northern Ontario. We arranged with the Department at Ottawa to allow an official to inspect these plots during the growing season. Mr. Raynor will give us a talk on this subject this afternoon. I was up there and looked over the work myself, and I have no doubt the position we took in this matter two years ago was the correct one. I am convinced more fully than before that an increased vigor in our stock of potatoes for seed purposes will result from having them grown in that north country. We have now in store here in Toronto a quantity of potatoes which it is our purpose to distribute to growers throughout this Province, and, possibly, if some of the Experimental stations on the other side wish to participate in this work we will allow them to do so. We hope to have their help in this matter. We have a quantity of potatoes to distribute to the growers of this Province to test that have been grown in this northern country, although we have not as many as we would like. The applications are ten times greater than the supply, so that if you do not get all you want you will know the reason. We should distribute a sufficient quantity of one variety to different points to supply a carload from each section. This will lessen the cost of handling very much and help our work in keeping the varieties distinct.

There is another matter we have done considerable work in and that is the fixing of legal standards of weight per bushel and bag of the different vegetables as they are offered for sale. This matter was touched on at our last Convention, and at a meeting of your Directors, the Executive Committee were empowered to take action and petition the Department at Ottawa, asking them to fix these standards for us. We went over the standard weights as fixed by the different State Legislatures in the United States and we decided on the following as the weights that we would petition our Government to fix: Artichokes, 50 lbs.; beets, 50 lbs.; carrots, 50 lbs.; onions, 50 lbs.; parsnips, 45 lbs.; potatoes (leaving them as they were before), 60 lbs.; turnips, 50 lbs. These are the weights per bushel. Weights per bag are—75, 70, 75, 75, 60, 80, 70. Before taking the matter up we got in touch with the Quebec Vegetable Growers' Association and had a conference with them at Ottawa. Going over the matter thoroughly these were the weights decided on between the Ontario and Quebec Vegetable Growers' Associations. A joint deputation from the two associations waited on the Minister of Trade and Commerce at Ottawa. A bill was prepared and passed by the Senate at the last session, making it legal. I did not know how far the matter had gone and I wrote the Deputy Minister of Trade and Commerce, Mr. O'Hara, and received a reply that owing to the dissolution of the House, the bill had not gone past its second reading

Ontario Vegetable Growers' Exhibit at Ontario Horticultural Exhibition.

in the House of Commons. Your Directors last night passed a resolution that the Executive Committee be empowered to take this matter up again with the Government at the coming session, and, if possible, get this Bill enacted. I need not enlarge on the nature of this application, except citing two cases. The statute as enforced to-day fixes the weight of parsnips at 60 lbs. One of our growers near Toronto took an order some time ago to deliver 50 bushels to a wholesale dealer in Toronto. When a bushel of parsnips is spoken of in Toronto it usually means a measured bushel unless an agreement is made to the contrary. The buyer can insist on receiving a legal bushel, that is 60 lbs. This man delivered 50 bushels in bushel boxes. The buyer took them in and weighed them and insisted on receiving 60 lbs to the bushel and the grower had to give it. He lost 15 lbs. on every one of these 50 bushels. We consider that the legal weight of a bushel should as nearly as possible approximate the actual measured bushel, and that is what has been embodied in this new Act, which unfortunately did not become law before the House dissolved. Then take potatoes; we have in Ontario no legal weight for a bag of potatoes, many opinions to the contrary notwithstanding. Quebec is the only Province to fix a definite legal weight. In that Province potatoes are sold by the bag at the legal weight: the rest of Canada fixes the weight per bushel but not per bag. Commercially speaking, potatoes weigh 90 lbs to the bag. It is the usual understanding, commercially, that a bag shall contain a bushel and a half, but the law does not make it so. A wholesale potato dealer in Toronto a few days ago said he had a large number of applications from people who wanted potatoes to hawk around put in 75 lb. boxes. You know what that means, and I need not enlarge on it. They want to buy 90 lbs to the bag and sell 75, and the man who buys thinks he is getting 90 lbs. It does not matter much whether the legal weight shall be 75, 80 or 90 lbs. so long as everybody recognizes the legal weight.

We have with us representatives from the Experimental Stations, from Jordan Harbour, from the Agricultural College at Guelph and from the Central Experimental Farm at Ottawa. This is as it should be. The Experimental Stations and the growers should get together as closely as possible. We need the assistance in our business of these men who are studying the thing from a scientific standpoint, and we can help them very much by applying their scientific principles to our actual work. The value of these depends very largely on how they will work out commercially—on their value to the grower.

W. J. Kerr: I am very glad you said what you did about weights and measures. There was a note in one of our Ottawa papers last Friday saying certain growers were selling potatoes in 75 lb. bags, throwing a slight on the growers, as much as to say there should be 90 lbs to the bag. The Chief of Police of Hull had up some fellows for selling in 75 lb. bags, it was said, and they got these potatoes, no doubt, in 90 lb. bags and were selling 75 lbs. It was not for selling light weight, but for selling around the city without a license. These were not growers, by the way. The huckster explained that he had bought a license and an outfit from another man in the City of Hull, and considered he had a right to peddle. On that plea the Chief of Police let him go. However, he had about 50 bags in his rig, and he got down around the back parts of the city and sold them all before he got back to Ottawa. The papers unfairly blamed the growers for selling 75 lbs. of potatoes for a bag, and warned the people to beware and see that they got the proper weight. I took it upon myself to reply to that and sent a copy to each of the papers laying down the facts as your President has just given them to you.

The President said something about cutting out the middleman. Here are some lines on this subject:

Jim Hill, he says only thirty per cent.
Of all the folks on this continent
Is raisin' grub for the rest to eat,
But them that do have the rest of us beat,
And the way to solve high livin's cost
Is to get out and farm it before we're lost.

Si Brown says that a week ago
His apples was makin' a handsome show,
So he picked a barrel, and just for fun,
Took only the finest, and not a one
That was specked or knurly, packed 'em fine,
And sent 'em prepaid by the fast freight line
Up to the city. He hoped for a lot—
Dollar 'n' a quarter was what he got.

Down through the orchard, all around,
Apples are lyin' on the ground.
Old Si Brown he looks and swears,
En says they can rot for all he cares.

But mother tells me that when she buys
It costs a lot to make apple pies;
And I kind o' wish that Uncle Jim
Would have some way occur to him
To fix things up 'twixt me and Si,
So Si can sell an' I can buy.

F. G. H. Pattison.—In several municipalities they have a regulation that potatoes shall be 90 lbs. to the bag, and that has proved a good law. There have been a good many convictions in some places.

The President.—I believe some of the towns in Ontario have municipal regulations fixing the weight of a bag of potatoes—the city of Hamilton, for instance. Cases have been tried here in Toronto. A policeman once arrested a man for selling potatoes short weight and brought him into court, but the magistrate dismissed the case because he claimed there was no law in Ontario fixing the weight of a bag of potatoes. You can fix the weight for the barrel but not for the bag. The police in the different towns can look after local conditions, but when you consider the amount of potatoes that are sold and transferred from one point to another you will appreciate the necessity of having one statute covering the whole Dominion.

SECRETARY-TREASURER'S REPORT.

J. Lockie Wilson, Toronto.

We are very pleased to have so many of the prominent vegetable growers from every part of the Province with us to-day, representing all the different branches. As farmers and vegetable growers we are often blamed for breaches of the law of which we are not guilty: an example of this has been shown us here by our friend Mr. Kerr, from Ottawa. Another discrepancy is the enormous difference in prices which consumers in this city must pay and those received by the producers. The city man begins at once to swear at the farmer, accusing him of extortion and of rapidly becoming a millionaire at his expense. This probably

accounts for the mad rush from the cities to the rural districts, where wealth accumulates and men do not decay. You who understand will readily appreciate the situation. The city man does not seem to understand that the vegetable grower or the farmer, the producer, is not the man to blame for the enormous prices that are being paid to-day. To illustrate my point I quote the following from this morning's *World*.

"PROTECTING THE CONSUMER.

"Two or three years ago the ice manufacturers of New Zealand formed a combine and raised prices. Without more ado the Government stepped into the field, started an ice plant and sold at cost. The combine promptly disappeared. Precisely the same principle is being acted upon to-day in Des Moines, Iowa; Indianapolis, Ind.; and other cities in the United States.

"Convinced that the middlemen were advancing the prices of farm products without giving the producer any better return, the mayors of these cities started to buy agricultural products and to retail them at prices sufficient to meet the first cost, transportation, and other distributive charges. In Indianapolis, Mayor Thanker has been buying potatoes in this way and selling them to the consumer at 75 cents per bushel. Up to November 11th he had sold 8,000 bushels, representing about $6,500, including cost of delivery.

"As a result of his determination to show up the commission men, and between the time when he announced his intention and the arrival of the first car, the wholesale price of potatoes dropped 35 cents a bushel, and the retail price was cut and has since been further reduced.

"The incident illustrates the only effectual method of dispensing with the middleman, if so be that he is responsible for undue increase in prices. It is one, too, which the farmers and growers of agricultural produce can apply to themselves if they are willing to follow the example of Denmark, Ireland, and other European agricultural communities."

This may be a pointer for those who intend running for municipal honors in the City of Toronto at the present time. City men and consumers are beginning to realize that the pressure is so strong, so heavy, that the salaries of laboring men are not going up in proportion to the enormous cost of the necessary farm produce that they are obliged to buy.

This seventh year of our Association is marked by progress in many lines. The spirit of co-operative effort is spreading rapidly among the members of our different branches, and many hundreds of dollars have been saved through the work of energetic officials in getting in touch with wholesale manufacturers and dealers, thus cutting out the large profits which formerly went to middlemen. Ottawa branch purchased three car loads of baskets and boxes, and St. Thomas Branch, with 74 members secured greatly reduced prices on the following supplies: 200,000 berry crates, boxes and fruit baskets; 875 lbs. of Paris Green; 3,000 lbs. ground sulphur; 73 barrels lime sulphur solution; 1,350 lbs. bluestone; 1,850 lbs. arsenate of lead; 1 car salt; 1 car land plaster; 1 car cement; 500 rods wire fencing; 2,800 lbs. straight wire; 2¼ tons binder twine; 16,000 lbs. fertilizer; 20 bushels seed grain and 28 lbs. seeds. Many of the branches have held monthly meetings during the year, some in the gardens of the leading vegetable growers in the district. One Society saved $200 in the purchase of berry boxes and baskets alone. Tenders were called for, and the lowest accepted. The Ottawa branch received grants of from $20 to $50 from four different municipalities in the immediate vicinity. This is system that might well be adopted by every municipality in the Province of Ontario where vegetable growers are at work, where branches of the Ontario Vegetable Growers' Association have been organized. The citizens of these municipalities, towns, villages or cities, are interested in the production of a high class of vegetables in large quantities, and at a reasonable price.

Globe Tomato in greenhouse, showing plants run to single stem.

Where a municipality has a branch of our Association they are not only doing a good turn by lending financial aid, but they are benefiting their own citizens as well.

The Directors of the Ottawa branch put up a splendid exhibit of the products of their gardens at the Central Canada Exhibition, which proved a valuable advertisement for the Association in that section. At the close of the Exhibition the whole exhibit was donated to the City Hospitals. This generous action of the officers of this branch was so much appreciated by the citizens that the use of the Assembly Hall in the Carnegie Buildings in Ottawa was given to them free of charge. I am of the opinion that there is no better method of advertising our Association than by having a combined exhibit at the Canadian National, the Central Canada and the Western Exhibitions. Ottawa in this regard has shown us a splendid example of what can be done by energetic effort in the way of advertising this Association.

One of the chief drawbacks to the progress of the vegetable growers in this Province is the lack of efficient labor. From every section comes the cry—"We cannot get a sufficient number of men, not even of an inferior class." The officers of the St. Thomas branch state, that in their neighborhood in the county of Elgin alone, there is a shortage of 1,000 laborers, and complaints have been made as to the unsatisfactory class of immigrant labor that is available.

The Brantford branch has more than doubled its membership by offering prizes to the members who secure the largest number of new ones. The Sarnia branch has specialized with early potatoes and found them exceedingly profitable. We are continuing the Membership Competition among the branches and the results will be announced at the Annual Meetings together with the audited Financial Report of the year's transactions.

A large delegation from our Association waited on the late Dominion Government and presented their views opposing the reciprocity pact, but were informed that their protest came too late to receive consideration.

We asked for Legislation from the late Dominion Government for fixing of Standard weights per bag and bushel, for roots and vegetables. The matter received the approval of the late Minister of Trade and Commerce, Sir. Richard Cartwright, and a bill was introduced into the Senate and received the second reading, but dissolution occurred and the bill was dropped for the present. I would recommend that the Executive bring the matter before the new Government at an early date, and I am sure it will receive, at their hands, the attention it deserves. In this connection it has been suggested that our Association appoint a Standing Committee on Legislation.

The potatoes grown in New Ontario continue to meet with the highest praise from consumers who have had an opportunity of testing them. With such splendid potato land available in Ontario I am sorry to have to state that tens of thousands of bushels are still being imported into this Province from New Brunswick and several of the American States. It is said by those who are in a position to know whereof they speak, that the finest potatoes grown on the continent can be produced on the Ontario Government's practically free grant lands in New Ontario, and as high as 200 bushels per acre have been grown in our Northland, and a ready home market is found for its product among the miners in the gold, silver and copper mines, which have made Ontario famous. At the present time the market price of potatoes in the mining district is $1.00 per bushel. Thus a farmer in New Ontario can produce without any scientific knowl-

edge of farming, at the lowest possible calculation 100 bushels per acre, giving him for the product of ten acres of land $1,000 for this crop alone.

If it is possible for the farmer of New Brunswick to grow potatoes and pay expenses of railway freight over 1,000 miles and still make a profit, selling them to wholesale dealers in Toronto at 70 cents per bushel, it does not require a very brilliant mind to figure out the profit of a man who gets his land practically free, that will give a maximum yield of first class potatoes, absolutely free from rot and fungous diseases, and who has not to fight against the ravages of the Colorado

Tomatoes in a Haileybury garden.

beetle and other pests and diseases, which are such a drawback to potato growers in older Ontario. And this land is not only suited for potatoes, but, practically, all vegetables, which are grown in the older sections of the Province, can be raised to perfection in that northern clay belt. In old Ontario there are 14,000,000 of acres of cultivated land; in New Ontario over 16,000,000, through which no ploughshare has ever been driven.

Here is a place that the starving millions of the older lands should know about. Here is a country with a larger acreage of cultivatable land than we have

in the whole of older Ontario put together. Any man with ordinary ability could clear up ten acres of that land, and plant it with potatoes and at the lowest estimate could raise 100 bushels per acre, or 1,000 bushels for the ten acres, that can be sold to-day in the mining camps of Sudbury, Cochrane, Cobalt and Porcupine for $1 per bushel, and is there a finer home market in the world that the settler could have than right in his own potato patch, in the district where miners in thousands are waiting to purchase his product at the price above named?

A great deal has been said and written lately about the high cost of the necessaries of life. It would seem to me that if the transportation companies would give us lower freight rates, it would help in the evening-up process. I could give you many instances where it would seem that discrimination prevails as against certain portions of this country. Here is one specimen brick. The railway rates on potatoes from St. John, N.B., to the City of Toronto, a distance of 1,000 miles, in carload lots are 22 cents per hundred pounds. For this same product from New Liskeard in Northern Ontario, a distance of only 334 miles, the rate per carload is 24 cents per hundred pounds. As can readily be seen, the length of the latter haul, for which a higher rate is charged, is only one-third of the former. Is this not discrimination against the struggling pioneer farmer of Northern Ontario, part of the burden of which is borne by the consumer in the City of Toronto. We are inclined to blame the middleman; perhaps it is not entirely his fault, it seems that the railways are to blame too. The railways should be asked that there should be no discrimination in favor of New Brunswick farmers as against the pioneer farmers of our Northland, and if we throw our energies into it, something may be done to remedy this discrimination in favor of distant Provinces.

The Central Association sent out a number of speakers to the branches, which asked for them, and good results have followed these meetings.

We will have a report from Jordan Harbour Experimental Station, re shipments of tomatoes to the English market.

I would recommend that an organizer be appointed to visit the different branches already in existence for the purpose of increasing membership, and also for establishing new branches in the different parts of the Province.

The Executive held eleven meetings during the year and the Directors two. The President and Mr. F. F. Reeves were delegates to Boston and Brockton Conventions, respectively, and you will, doubtless, receive reports from them as to the proceedings there.

I have to thank the officers and members for the assistance extended to me in my branch of the work during the year that is approaching its close, and I wish you continued and even greater prosperity in 1912.

We have a great work to do. The officers you elect at your incoming meeting must be up-to-date men. Your local branches must work for the interests of the Association at every turn. Do not elect men who are simply wanting to get into office for the purpose of sitting down and accepting the honor, and then doing nothing. These men are absolutely no good to any kind of institution, and the sooner you replace them the better. You want live men, because this is a live institution. You want men who are up-to-date and not satisfied to creep along in a snail-like fashion, like a few of our branches are doing. We must be up and doing; we must rise to the occasion. There is a bright future in store for this organization, if you will only put your shoulder to the wheel in the way some of our branches do. "Work, for the night is coming, when man's work is o'er."

I thank you for the courteous manner in which you have received my report.

J. D. Fraser.—You were speaking about getting an equitable freight and express rate. From year to year nothing is done. We still pay the same old rates. Would it not be well to discuss it thoroughly and see if something cannot be done definitely? The Railway Commission have asked for a report of our conditions, and we have given it to them over and over again, and the carrying companies can, apparently, send their lawyers and put in very rosy statements as to the treatment of the farmers, and we still find ourselves fighting against heavy odds and making but little progress. Now that the new Government has come in we should do something toward getting a representative on this Railway Board, who would look after our interests.

The President.—The suggestion is a very good one; it is an important one to a great many. Mr. Fraser's suggestion is, I understand, that we should endeavor to get some one in close touch with the growers—some one in sympathy with the growers.

J. D. Fraser.—We ought to try and make our influence felt in some way. We had a member of the Commission give an address before he was appointed, and he made promises of getting this thing righted. He is down there now and we have heard nothing of him. We would like to get some one on there who would either do something or resign.

Mr. French.—I was going to add something to Mr. Fraser's remarks. I would suggest that we form a Committee of some of our large growers who know the needs of the matter, to deal with the question. The Ontario Fruit Growers' Association have a committee of a similar character working along the same lines.

J. Lockie Wilson.—The idea is a very good one. I am doubtful if we can get a member of our Association put on the Railway Board; but I may say that the Dominion Railway Board is doing excellent work, and I don't think there is very much complaint to be made against any of their decisions when these questions are brought before them in a fair way. The thing is to let them know you have a grievance and what that grievance is, and if you do that in a fair and reasonable way there will be results. Mr. Mabee, the Chairman of that Board has impressed me at least, and I think a good many people of this country, as a man who is trying to do the fair thing as between the carrying companies and the consumer.

Moved by G. French, seconded by W. W. Weaver: "That this Convention appoint a Transportation Committee, whose work will be to bring before and urge on the Dominion Railway Board, the question of a fair adjustment of freight and express rates."

The following were appointed as a Committee: Messrs. Fraser, French, Kerr, Weaver and Adams.

These names were submitted to the Convention by a motion which was carried.

W. J. Kerr.—I would like to enlarge on a few statements the Secretary has made, one in connection with the co-operative buying of the Ottawa branch. Last year we purchased seeds, or at least a portion of them, co-operatively. We saved in price, but unfortunately we did not save in quality: but this year one of our local seedsmen has come forward and offered to supply us with seed from any seedsman we choose to select in America, or in Europe at wholesale price. He is prepared to show us his invoices and give us seed at invoice price. Of course it is understood he gets a trade discount, cash discount, etc. The decision was made to tender him a reasonable percentage of profit on these seeds. They are to be delivered in the original packages from the growers direct to ourselves. In that way we hope to get fresh seed, and to make a considerable saving. A

grant has been given us by the different municipalities in which we work, the three townships in which most of our growers live; each has granted us $20 for the purpose of encouraging our work, and the City of Ottawa has donated $50, and we hope next year to get a grant from the City of Hull, which makes a nice little sum to help along our work, and I don't see why any of the branches cannot do the same thing. When we went before the City Council (the Township Councils had no objection whatever) only two members of our Board of Control made any objection, but it was over-ruled on the strength of encouraging our work. That will induce the growers to produce the best they possibly can for the people of the city, and we hadn't any difficulty in getting that through. Some of you may be too bashful. The Horticultural Societies get what they ask, and if you don't ask you won't receive.

Argenteuil Asparagus. Four-year-old patch on right.

The Secretary also referred to the starving millions who could find homes for themselves up in New Ontario. The main thing, however, is to have a better class of immigrants brought in. I am very sorry to say that our Governments, and not only the Governments, but private enterprises, have brought into our country from Europe many that this country would have been very much better without. We have them around Ottawa, and I fancy you have them here. They have been starved, no doubt. They are no use to us and they will starve wherever they are. Possibly some future generation of these people will be of some use to us, and while we need their labor—need it sorely—this class of labor is so poor that we are better without it. If we could bring out the better class of citizens, that would solve the problem. We have people making a very good living on four acres. Ottawa is growing so rapidly that land is becoming very expensive. However, one can make a very good living around Ottawa, and I believe he can do the same around Toronto or any other city.

F. G. H. Pattison.—I would like to draw your attention to something that is important. Your exhibit at the Canadian National Exhibition this year was not accorded fair treatment, at least I don't think so. It is a shame that where

a Province has a Horticultural building intended to be devoted entirely to horticulture and to vegetables, the vegetables and a considerable portion of the fruit exhibit were relegated to a tent, whereas, grain exhibits from other Provinces were admitted into the Horticultural Building which was supposed to be reserved entirely for horticulture. That is not right. The tent, the vegetables were in, was not a very large one at that, and the ground was muddy.

J. D. Fraser.—Mr. Wilson has drawn our attention to the fact that Mr. Mabee has acted fairly as Chairman of the Railway Commission. We do not want to let the impression go out that we think he has not. We cannot expect Mr. Mabee all alone to look after these details, he has so much to attend to. There are as many people interested in the shipping industry as there are growers on the soil in this Province, and we should in some way make our needs felt; we have been drifting for the last ten years, and we would not like to let the impression go out that we are condemning the whole Railway Board when we are only condemning certain members of it. It is time that something was done.

The President.—We have appointed a good strong Committee of practical men, and we hope something can be done. Mr. Pattison spoke of the treatment of the vegetable growers at the Exhibition. They were cramped for space, and I understand the Ontario Government is to erect a building in time for next year, which will take care of the Ontario Government exhibits. This will give more space in the Horticultural Building, and will, I trust, relieve the situation. I leave it with you if a protest by resolution at this time would be advisable. It would be quite reasonable for this Convention to pass some resolution in the matter and place themselves on record as protesting against the treatment received, and hoping that we may have proper accommodation next year.

J. Lockie Wilson.—It is a Horticultural building and it would be a misnomer if you got any and all kinds of stuff in there. There should be a Provincial Building, where Alberta and Saskatchewan, British Columbia, and the other provinces could exhibit their stuff and not crowd us out. It is not fair to do that.

Moved by W. W. Weaver, seconded by T. A. Newton: "That the Ontario Vegetable Growers hereby protest against the treatment received last year from the Canadian National Exhibition, and request the authorities to give us proper accommodation and try to make better arrangements for the fruit and vegetable growers, and that a copy of this resolution be sent to the Manager, Dr. Orr and the President, Mr. Gooderham." Carried.

ON ORGANIZATION.

C. W. Baker, Tamblings.

I have the subject that will settle all your grievances. If you give it a good trial you will get everything you want. If you organize right at the start that is the main thing; it all depends on that.

The statement that "We have keys" to all doors, is no poetic utterance but a fact. The Ontario Vegetable Growers' Association holds the keys that will unlock any and all doors that are to-day closed to the man of the spade, the trowel, and the hoe. I make no apology for opening with this sweeping assertion, because it is absolutely true.

We have not realized as fully as we should the great power and mighty influence of this key. Some of us have prized it, some have used it, and in the using have discovered that if used with tact, skill, patience and all earnestness, it is truly the key, and thanks to the able and efficient officers of our Association and the aid so wisely given by the Ontario Government through the Ontario Minister of Agriculture, we not only hold the key but are provided with some considerable part of the power needed to turn it. We are all agreed that a key can serve no useful purpose carried always in the pocket or stored in a safe deposit box, but if used at the critical moment it makes all the difference between darkness and light, between the old rut and the new road, between individual cramped coldness and co-operative, unsuspicious warmth; between the narrow "know-it-all" gardener and the wide-visioned, up-to-date commercial grower.

Every man, every vegetable grower, every small fruit grower, in this Province should have the door opened that allows him to profit by collective wisdom and the concentrated thought of many minds.

You have by this time surmised that the key is "organization." I shall endeavour to lay before you as quickly and concisely as possible the subject, "Organization," in three sections:—

(1) Why organize.
(2) How organize.
(3) When organize.

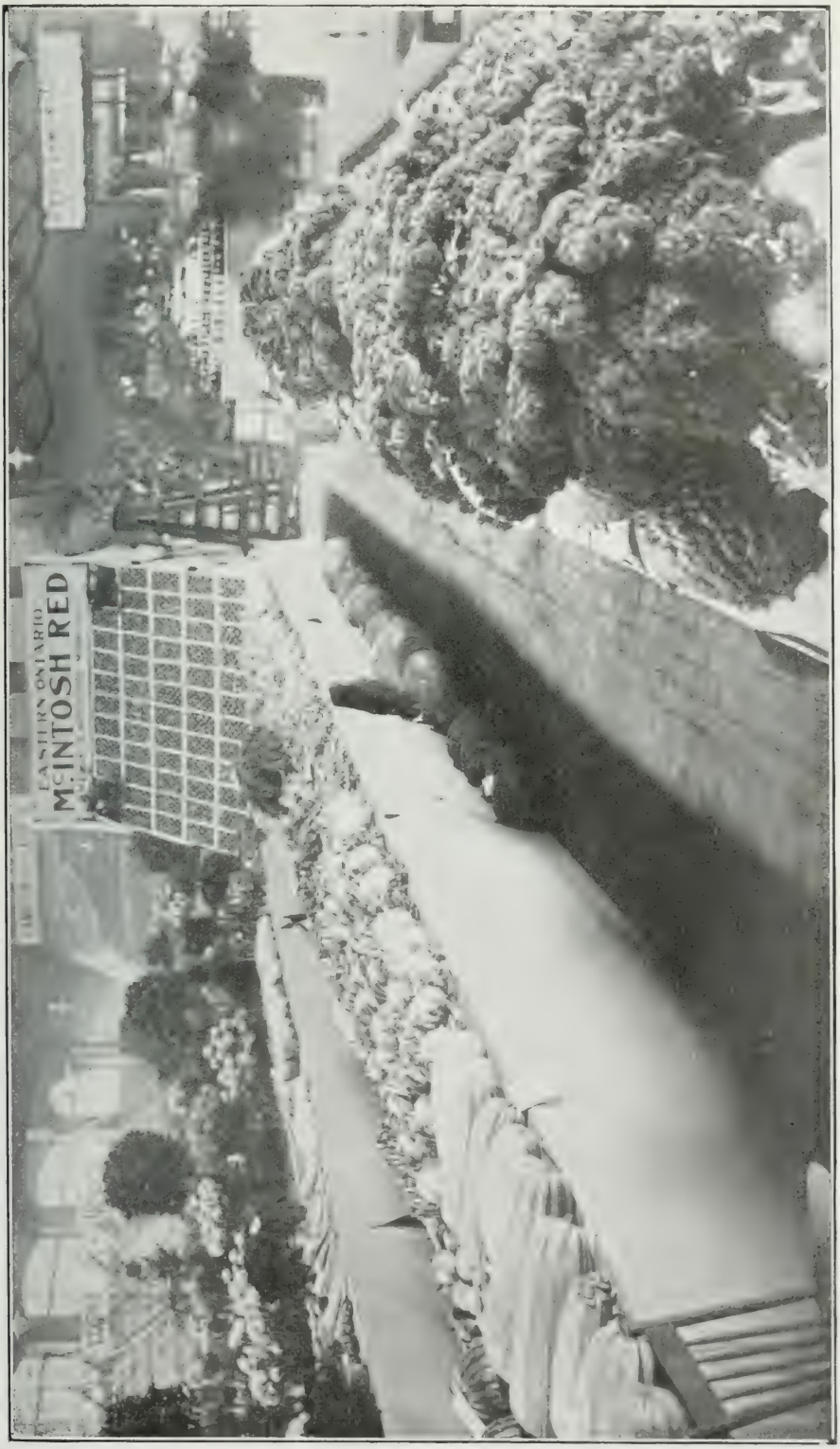
(1) Why Organize? Because growers of vegetables and small fruits are anxiously waiting for just such an opportunity of banding themselves together for mutual benefit, as the Ontario Vegetable Growers' Association has to offer them, but as the man with the message has not come among them they remain in most cases in the dark as to how to organize. Now, we, who are enjoying the great profit and pleasure of being members of this young Association, with its great possibilities, should take ourselves seriously, and every man should feel that he has a duty to perform, that duty is "Get a new member." Hustle for your man.

Why Organize? Because not a grower in this fair garden of Ontario is living up to his privilege, nor is he getting the most out of his business if he is not a member of the Ontario Vegetable Growers' Association. So, I say, we have the key, let us unlock the door and let our fellows in.

Why Organize? Because if we would increase in influence and power we must have largely increased membership. Municipalities and the Ontario Government have encouraged us; we must show that we appreciate their help by growing not only better vegetables, but growing in membership. Organization will promote and encourage vegetable growers to the point where we can procure better returns for our labour, our patience, our thoughts.

Organization makes it possible to disseminate among our people that information which we need, new ideas, new practice in up-to-date methods.

Organized and affiliated we are equipped and ready the moment our industry is threatened, from whatever source. For instance, did it not thrill you and make you proud of our Association, when our esteemed and honored President made that memorable appeal on the floor of the House of Commons to the then Premier of Canada, urging in a few well-chosen earnest words that the vegetable industry of our land be not sacrificed. Thomas Delworth's words as President of the Ontario Vegetable Growers' Association had a great deal to do with the result, and were



Vegetable Exhibit.

quoted and printed time and again. Without organization, gentlemen, the vegetable grower would not have been heard from.

(2) How Organize? To my mind the proper natural way we should grow is by reaching out from organized centres. Several branches came into being because the expansion spirit took possession of men who were already enjoying a great privilege and profit in their respective branches. The lack of the missionary spirit among our members is where we fall down. *We must expand, we must grow.* No member can do a worthier thing than put his shoulder to the wheel of progress and help his fellow grower to better things.

At our last Convention our esteemed Secretary spoke of a future membership of 5,000. If we stand shoulder to shoulder, and man to man, it can be accomplished in two years. I believe with Mr. Kerr, of Ottawa, that the ladies should be invited to join. How many men have made a success of vegetable and small fruit growing without the help of the women?

Successful organizing can only be accomplished by hard, systematic work. Perhaps I cannot do better than repeat to you the simple story of how six new branches were organized in eleven days, viz., Brantford, Stratford, Berlin, Oshawa, Belleville, and Picton.

Mr. S. D. Dawson and the speaker arrived in Brantford one market morning. We immediately got in touch with several growers on the market, explained our mission among them, got names of as many vegetable men in the surrounding district as possible, together with their respective post office addresses, hired a livery rig, called on a great number in the afternoon, got mentioned in the papers, asked about the best time to hold a meeting, made arrangements for a good room to hold it in, told a few enthusiastic men we would notify all growers in a few days of a gathering for the purpose of organizing a branch of the Ontario Vegetable Growers' Association then. We departed for Stratford, and repeated the same work, and then on to Berlin, and met with the same encouragement. Arrived in Oshawa and saw some of the principal growers; one enthusiastic gentleman drove us to see the growers adjacent to the town, held a meeting the following night, told those assembled what benefit the Ontario Vegetable Growers' Association had brought to us in our home branch, the value of the monthly meetings, the new ideas one can gather while discussing questions of vital importance to men engaged in our business, the great profit that accrues to the members by co-operative buying, the opportunity of procuring better seed potatoes from New Ontario, grown for us by the Ontario Government. Fifteen men paid in their membership that night. We wrote postcards to the growers of Berlin, Stratford, and Brantford, to call meetings in their respective cities in a few days' time.

Went east to Belleville, started work on market at 9 o'clock, had meeting at 2 o'clock. A good branch of ten members resulted from five hours' earnest talk among the growers of Belleville.

At Picton, P. E. County, we found the growers enthusiastic, and held a meeting the following evening; had no trouble in getting them to organize.

On our way home we held meetings at the three cities we had visited, and had the pleasure of organizing a branch of the Ontario Vegetable Growers' Association in each, six new branches in eleven days proves that men want the Ontario Vegetable Growers' Association; also proves that in two years we can have 5,000 members.

In most places we heard the pessimistic one say: "Oh, it's no use, they won't stick together." I am optimistic enough to believe that a branch well officered

with men of tact and personal magnetism will not only be very much alive, but will attract new members each year. Good live topics, talks of an educative nature, exhibits, discussions on papers read; in summer, visits to gardens, picnics, outings, all are needed to make a Branch Association stay organized.

(3) When to Organize. This is, in my humble opinion, the paramount and important question that should command our attention, and our immediate and earnest consideration. Why wait? Our fellows are waiting for the man with the message. They have the key, but are in the dark as to how to use it. It is our duty to open the way; to turn the key.

When, when; that is the question. The winter season is on, why not make an extra strong effort to organize many new branches this year? *Let us be all at it, and always at it.*

Youthful Market Gardeners.

Let the slogan be Co-operation.

Co-operative buying and Co-operative selling are the great drawing forces that attract growers and induce them to become members. Think of a man paying 50c. membership fee and saving from five to fifty dollars on his season's supplies The London Association has successfully carried on co-operative buying for three years. Here are some prices showing the saving to members by co-operative buying:

	Individual.	Co-operative.	Save.
Tomato baskets	$4.00 per c.	$2.65 per c.	$1.35
Fruit baskets, 6 quarts	4.00 per c.	2.65 per c.	1.35
Berry boxes, quart	3.50 per m.	2.75 per m.	.75

St. Thomas bought last year, $9,000 of supplies, land plaster, baskets, cement, fertilizer, coal.

Let us be awake to every opportunity, take on new life in our home branches, and extend and reach out until every district in Ontario, where men grow vege-

tables, shall boast of a Branch of the Ontario Vegetable Growers' Association. Were I possessed of a huge megaphone that would reach every grower in this fair Province I would feel like calling in clarion notes, "*Organize, organize, organize.*"

A MEMBER.—There are two districts in our section, Smith's Falls and Brockville, and no organization: we have written stating we would like information in connection with the matter, and that we would like an organization started, but have not even been condescended a reply. What they want is a man like Mr. Baker to warm them up; they want to come in.

THE PRESIDENT.—A suggestion was made with regard to the need of an organizer who would take hold of this work; what do you think of that?

A MEMBER.—It would be a good thing to have a live official organizer.

THE PRESIDENT.—If the question is of sufficient need we would be wise in appointing somebody this winter to act as organizer for a week or two through the Province where they are not already organized. What do you think about that?

W. J. ROBB moved, seconded by W. W. WEAVER, "That Mr. C. W. Baker be appointed organizer, and that he be asked to devote a few weeks of his time this winter to organizing under the direction of the Executive Committee."

A MEMBER.—The President should be on that as well.

THE PRESIDENT.—No. You cannot get a better man than Mr. Baker. Organizing is a work that Mr. Baker has been more especially interested in, and he has been very successful. Your President is *ex-officio* member of all committees, and if you had any idea of the volume of work already on his hands you would not want to add any more.

The motion carried.

J. W. RUSH.—The organizing will be all right, but would it not be well to have a few good, live men go around amongst the weak branches and stir them up? Our Toronto Branch has lost this year about 60 members. If that is so, something should be done to bring up the membership by showing them the benefits of organization. If a man gets $2.00 where he got 50 cents that should be used in advertising to get others to join. The most successful vegetable growers around Toronto and other parts of the Province are men from the Old Country, who were shoemakers, tailors, printers, bricklayers, and plasterers. Their trade was so bad 30 years ago that they could not get along, and they came out here and settled on land to make a living. They are men who have got good homes—homes that put mine in the shade. They are men with brains. Not only that, but they have the willingness to work. Go to these men and advise them and tell them the benefits of organization. Mr. Kerr spoke of the poor class of immigrants that have come in—Englishmen and Scotchmen and Irishmen—I have the greatest sympathy for these men. I was one of them myself. All they want is a little help and encouragement and sympathy. Everything is strange to them at first. Let us give them an encouraging word. Tell them they have come to the finest country in the world. This winter we must see if we cannot encourage men to come into our membership. Mr. Baker will require some local men in the districts where he is going to help him along.

A MEMBER.—He can do it.

J. W. RUSH.—Our President and others will be glad to assist him and we look forward to good work.

W. J. KERR.—I am afraid my remark may have left a wrong impression. I do not wish to be understood as criticizing the importation of foreign labor—not by any means. The best man I ever had on my premises was an Englishman, but we

have a lot of men and women around Ottawa from the old lands that should never have left there. They are a burden on the communities; they were no good there, and they are no good here.

C. W. BAKER.—The reason why one branch lost membership was that they elected to the Presidency not a farmer, but a lawyer, and that in spite of the fact that we warned them to get the right men for their officers. It is a foolish thing for growers to have any but their own men for officers. It is the lack of enthusiasm that kills branches; they must have that.

W. J. ROBB.—The complaint Mr. Wilson speaks about is a live topic in Elgin County. The production of farm produce is hindered by the lack of help. We have had a good deal of experience with help from the Old Country. I placed 37 of

Dwarf French Bean.

these men one year, and they gave the very best satisfaction. One of our men said he could pick up 100 men in his home county. There are thousands of good men in the home land whose only fault is their poverty. We should be allowed to supply a man of our own choosing, subject to the Department's approval, who would represent us in the Old Land to pick up farm help. We don't require a representative for the County of Elgin alone, but for the Province. Is there any scheme by which a responsible man could go over there and get these men? I made application through an immigration agency for a boy 17 years old, and they sent me a man 57 years old, a man who was a butcher at the Smithfield market. He was a first-class butcher, and I took him to the St. Thomas Packing Company, and he is now getting

$60 a month. In their own calling they will make a good success. We are all descendants of English, Irish, and Scotch.

With regard to New Ontario, there are thousands of acres along Lake Erie that are wonderfully adapted for growing fruit. I would like the opinion of the members here on the question of sending a man to the Old Country, so that I can report to my own organization.

THE PRESIDENT.—We want a discussion on this matter, but Mayor Geary is now here, and as we are indebted to the City of Toronto for the use of this spacious room we would like to hear from His Worship.

MAYOR GEARY.—We are very glad to have had the opportunity of affording you facilities for meeting in this building, and on behalf of our City Council I give you a hearty welcome. We are pleased to have associations representing the people of the Province gather in the city of Toronto. Sometimes outsiders speak of Toronto as trying to grasp everything, but I do not believe that that view obtains now throughout most sections of the Province of Ontario. All of us, from the very smallest rural post-office to the largest city in the Province, are pulling together for the advancement of Ontario. It is a Province of great possibilities, and needs the work of this and kindred associations, to place it in front of any other Province or State in the world. Your Association has a great deal to do with the advancement of Ontario's reputation. We in the city of Toronto depend upon those who till the soil. We do not grow vegetables to any extent here, but we have men in the suburbs whose interests we desire to encourage, and who are almost citizens of Toronto, inasmuch as they participate in our affairs, who are engaged in producing vegetables. The Province of Ontario can do its part with the rest of the Dominion in helping to establish a Canadian reputation. If we sell manufactured goods to the Old Country, and they are superior goods, our reputation is increased by that fact; if we sell good vegetables (and we are glad to say we can and do produce them) we enhance the reputation of Canada throughout the world. Now is the time to establish a basis of national character—because we are just in the making—a reputation which will endure for all time to come. We are proud of the people from whom we come, we look back on their deeds and we treasure the traditions they have handed down to us, and we in this country in vegetable growing, in furniture making, in statesmanship, and in everything that goes to make a nation's reputation, if we go on in the way we have, will surely make our mark. Your Association is one that has to do with the material welfare of the people of this Province. I am glad to see you here in such numbers, and notice the active interest you take in what concerns you. May that interest continue, and my hope is that your welfare will be bettered by your work in every possible way. We in the city are glad to have you with us, and we wish you all success. Anything we can do to make your visit pleasant will be done. The freedom of the town is yours to do with as you please, and I think from the personality of this Convention we run no danger. The people of the corporation of the city of Toronto are delighted to have you, and will be only too glad to extend you facilities for meeting here whenever you desire to come. You are very welcome to Toronto.

THE PRESIDENT.—Returning to the previous discussion, there is one thing we have to remember when we bring men out here, and that is to give them steady employment, if possible. A great deal of the difficulty in securing proper help is owing to the lack of this. So many men are only wanted for a few months in the year. What are men who come from a climate where agricultural employment covers the twelve months going to do the rest of the time? I have a Scotchman

Exhibit of Ottawa Branch at Central Canada Exhibition.

who came out last spring working for me, and also a young Englishman from the north of England. Over there they worked the whole year. Unless we are prepared to remedy that defect we shall have trouble in getting proper help. Mr. Herold, of the Bow Park farm, Brantford, who employs a number of men, says that is their difficulty. Each man will have to settle for himself, how to keep employed all the year round the hands he wants in the busy season; unless he does that he will have trouble.

W. J. Kerr.—Mr. Robb's suggestion to have a man represent us in the Old Land is a good one. There are in that country men who received their appointments through political influence, men who are not in sympathy with the farmer, and there is a possibility—a very strong probability—that they will exert an influence that will bring to this country a great many men that are not suitable. It is quite reasonable to expect that if we sent a man over there familiar with our needs this difficulty would be largely done away with.

F. G. H. Pattison.—The difficulty can be solved by employing married men. One of the largest fruit growers in the Niagara district compels the married men to take boarders. It is important, if vegetable growers employ a lot of help, that they put up a house of sufficient size so that the married men can take boarders. You will find that you can employ help the whole year if you have got your help where you can find it when you want it, and it is not likely to go away. Another thing, in growing small fruits, it is a great advantage to get men from the Old Country, with large families, who can be utilized for picking apples and small fruits. One of the strictest regulations, when married men are hired in Winona and district is, that they must keep boarders. Some of these places have two, and sometimes five or six houses for married men. That solves the problem in two ways. Many of these boarders only stay the eight months, but they are satisfied with the board; in the winter they go to something else; the married men are all hired by the year. That is the secret of keeping your help; get married men and around that nucleus gather your other help.

Geo. Cooper.—The proposal to send accredited agents of the Association to the Old Country is a step in the right direction, especially if their appointment is Government franked. I have given some thought to the subject, and have debated it on several occasions with Prof. Crow, when at Guelph. There are several reasons for the present unsatisfactory conditions. One is, the unscrupulous conduct of so-called agents; these men's living depends on the number of emigrants they can ship out here, therefore "class" or "type" is of small account.

Again, take the work of the Salvation Army, and The East End Emigration Society. The main work of these is confined to the type of emigrant who previous to coming to this country never saw a field or a cow, yet it is drilled into them by officers of these associations that Canada is an Eldorado where an easy living may be obtained. When I came to Canada there were 200 members in a party under the charge of a captain of the Salvation Army. This man, who claimed to have been five or six years in Canada himself, made the statement at a meeting on shipboard, that anyone could learn farming as practised in Canada in six months. There are many such false statements made. Yet these people are getting Government assistance.

The solution, or partial solution, lies in the appointment of men, who are versed not only in the state of the particular labor market (be it agricultural, manufacturing, or any other) they represent in Canada, but who as old countrymen, are also conversant with the particular districts in which the required laborer is

to be found in England. Further, such men should be placed in such a position that they are beyond any influence, either politically or financially.

Another drawback which emigrants of the required type have to contend with in England is lack of finance. It is much easier for men of the "mechanic" or "factory hand" type, whose homes are in our large cities, to obtain financial assistance to emigrate than it is for the deserving farm laborer, or tiller of the soil. There are thousands of the latter class in Great Britain to-day anxious and willing to come out here, but prevented through lack of money. The members of any association who are willing to give this assistance, or get their Government to do so, are on the right track.

Again, as to keeping required help: there is no doubt that the employer who engages his help by the year, and, if it is satisfactory, gives some encouragement for it to stay another year, is the man who is going to overcome the labor difficulty.

Mr. Pattison suggested the employment of married men, with the stipulation that they board a certain number of single men. That plan is all right, so far as it goes, but, on the other hand, many good married men may be lost through such an agreement. Personally, I would absolutely refuse to take in boarders. I want home comfort and privacy, which is absent when the boarder steps in. In the Old Country, in our large gardening establishments, where any number, from three to ten young men may be employed, it is customary for the employer to provide a "bothy." This is in fact nothing more than a single man's quarters. It, as a rule, though not necessarily, is two stories: downstairs is a kitchen and dining room, with, in many places, a reading room supplied with current garden literature, and garden reference books. Upstairs are the men's bedrooms. The place is kept clean, and the cooking usually done by some woman who is paid a small sum by the employer for so doing. Now, why cannot some such scheme be carried out by the growers (whether fruit or vegetable) co-operating: building a central building in their vicinity, equipping it on the lines stated herein, and putting a caretaker in charge, who could keep the place clean, cook any meals required, and make things homelike and cheerful for the youg men after a day's work.

Such a place, where several young fellows could sit down in comfort, smoke, read, play games and write their letters, etc., would help a long way in solving the labor problem, in addition to counteracting the present tendency to run to the hotel. After all, congenial company goes a long way towards helping to make a person feel contented with his occupation.

O. Herold.—On our farm, in the summer time, we have 65 or 70 men. We advertise for help, but about 90 per cent. of those who apply are no good for our work. We employ all the winter time about 25 men. We employed this year Greeks, Germans, Scotch, Irish, English, Italians, Frenchmen—all nationalities. These are all very good men,. It is most important that we should get experienced help from the Old Country. Agriculture is the future of Canada, and the success of it depends largely on experienced help.

J. W. Rush.—If you want to get the right type of men let us appoint a man and send him to the Old Country and see what he can do. The immigrants may be a little slow at first and require time and patience in teaching. I had experience with a Swede this year, who had been mate on a steamship. He had never worked on the land, and came to me for a job. I instructed him carefully, and in less than a week he could plow well. All he wanted was proper handling.

Moved by W. J. Robb, seconded by O. Herold, "That the members of the Ontario Vegetable Growers' Association, assembled in Convention at Toronto, peti-

tion the Government to allow the Association to select a man or men to represent them in the Old Land each year, to procure desirable farm help, as the men sent out by the average booking agent are not conducive to best results." Carried.

TOMATO GROWING FOR THE BRITISH MARKET.

GEO. COOPER, GRIMSBY.

I am not quite sure as to whether it is the "growing" or "marketing" of tomatoes in which you are most interested. As far as the former is concerned, I may safely dismiss that portion of the subject in a very few words. After a perusal of the various reports on the experimental shipments made, and criticisms of the same, I have come to the conclusion that the weak part of this proposition lies in the system of marketing the produce.

Having had some fifteen years experience of the English markets as a commercial grower of fruit and vegetables (principally tomatoes) I may, perhaps, be able to bring out some points which may be of assistance to you.

This subject of "Tomatoes for the British Market" has been discussed before, and experimental shipments have been made under the direction of both Dominion and Provincial Governments, with results which from a financial view, at any rate, seem to negative the possibility of successful commercial shipments being made to that country.

In the official reports, and in the press and other criticisms, various reasons are given for the shipments to Great Britain not being a commercial success.

I will deal with a few of these.

In one of our Horticultural papers we find the opinion expressed, "that English people only require tomatoes of the delicate, mild flavoured, hot-house type." also "Our tomatoes, English people say, are strong flavoured, coarse and not at all suited to the English palate, and are, therefore, not wanted at all."

These arguments are weakened by the further statement, "that, whilst the writer of it agrees that Canadian tomatoes are of better flavour than English ones, Englishmen do not think so, as taste is largely a matter of habit."

I would remind the writer of those words that taste may also be acquired, as is testified to by thousands of Britishers residing in Canada to-day.

And, there is not the least doubt that if the people in Great Britain had the opportunity of purchasing Canadian-grown tomatoes, they would soon acquire a taste for them. Another argument advanced against the suitability of our tomatoes for the British market is their size. Curious as it may seem, this argument is more real than the question of taste, and for the following reasons:

When the tomato was introduced in the British Isles it was at first only grown for the tables of the epicure, and was, owing to its natural history, treated only as a fit subject for hot-house cultivation. As we all know, the earlier varieties gave fruits which were corrugated, and uneven in size and appearance, and were not at all suited for decorative purposes on the table of the aristocrat.

But by careful selection these objectionable traits have been overcome, and fruits of medium size, perfect in color, shape and flavor have been obtained, suitable to hold their own for decorative purposes with any dessert fruit.

So educated to this medium sized type of fruit, not the flavor of it, has the British housewife become that she will ask for small tomatoes when purchasing

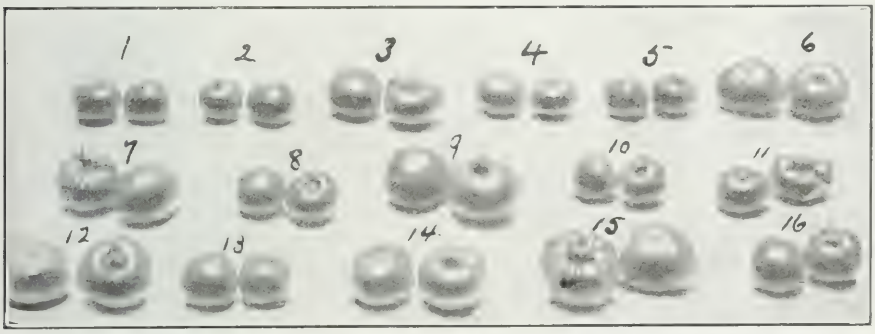
them at the store. We must also remember that the British custom is to serve the fruits at table whole instead of sliced as in this country, hence the objection to a large tomato.

The gentleman before quoted goes so far as to say "that a tomato of suitable size, and possessing the requisite qualities, cannot be successfully grown in our climate, without totally altering our whole methods of tomato culture."

This is an argument to which I have been unable to find an answer, for the reason that I fail to grasp his meaning. Does he mean us to understand that we are so asleep, that it is beyond the powers of our growers, or horticultural institutions, to produce a tomato in Canada equal in "quality" and "size" to the majority of those sold on the markets of Great Britain to-day?

If so, I for one totally disagree with him. Fully 75 per cent. of the tomatoes consumed in England to-day are not hot-house grown at all, but are the product of the open air of Spain, France, Canary Islands and the Channel Islands of Guernsey and Jersey.

Talking with a grower a few weeks ago on this subject, I pointed out to him that the United States had already taken advantage of the experiments made in



Types of Tomatoes: 1, Combination; 2, Comet; 3, Stone; 4, Faultless; 5, Best of All; 6, Ignotum; 7, Magnus; 8, Winter Beauty, Sutton; 9, Chalk's Jewel; 10, Rockford; 11, Earliest of All; 12, Noble; 13, Frogmore; 14, Lorillard; 15, Livingston's Beauty; 16, Sutton's A1.

this country, and, during last September they made a successful shipment of tomatoes to Sheffield, England, the only objection urged against them being one of size. The variety meeting with most favor was the "Stone," which was pronounced better in flavor than the Canary Island product.

This gentleman advanced the argument that the United States would be better able to produce a type of fruit likely to meet British market requirements, than Canada, owing to their growing seasons in the south being longer than ours, thus enabling them to produce fruit with a "stamina," if I may so express it, better able to stand the journey without "breaking down" so early after arrival.

We in Canada are, however, no more handicapped in the matter of length of growing season than are the outdoor growers of the Channel Islands, England. In the Island of Jersey the tomato crop is not planted out until the middle, or last week of June, after the early potato crop has been harvested, but, as their summers are hot and the growth of vegetation rapid as with us, they have no difficulty in ripening and clearing their crop by the end of October.

Now, as to the possibility of Ontario being able to grow suitable tomatoes for the British market, I do not think there is the least doubt of it.

What is the type of tomato likely to meet with favor in that country?

The fruit should be of a medium size, of a good attractive scarlet color, round in shape, solid in flesh, with little pulp, taste slightly acid, without roughness or blemish, and weighing 5 to 6 to the pound.

There are at the present time several tomatoes of English type being grown in this country and the United States successfully under glass, and to a small extent outdoors, such as Sutton's A., Best of All, Abundance, Comet, Industry, Stirling Castle, and Eclipse. All these varieties are also grown and ripened outdoors for market in England.

Of American varieties classed as medium in size, and of the requisite color, the following might be mentioned as likely by careful seed selection to supply fruit of the type required:

Earliana (Langdon's Select), The Stone, Freedom, and Wealthy.

Or the necessary type could be obtained by a cross between selected stock of the two types, English and American.

That we have suitable land in abundance for tomato growing is, I suppose, conceded by all.

During the month of August I was employed in the County of Lambton making a survey of land suitable for growing truck crops. I found in one township alone, thousands of acres of sandy loam lands of a quality particularly suitable for this industry, well supplied with railway accommodation by both the G. T. R. and C. P. R., the present owners in many cases being anxious to sell, to proceed to the West, they said, yet having the way to independence and comfort actually in their possession.

On many of these farms plots of tomatoes were growing which had been planted out early in May and which were carrying good crops of fruit; but so little interest was taken in them that in no single instance could I get the name of the variety.

Presuming that a suitable type of tomato is forthcoming, I see no reason to depart from present methods of raising plants, setting out, and cultivation as carried out by progressive growers to-day; with the exception, that, personally, I would be inclined to either support my plants clear of the ground on a low trellis, or provide each plant with a mulch of long strawy manure, or something similar, my object being: 1st, to keep the fruit clean; 2nd, free from direct contact with the soil (which has I think a tendency to produce rot and other fungous diseases, during, and after a wet period); 3rd, to promote a free air circulation around the plants to induce vigor and disease resistance.

As to putting the crop on the British markets. Mr. Ruddick in the circular issued from the Dominion Dairy and Cold Storage Department gives the following charges on each case of tomatoes of 6 to 8 pounds, shipped to England as an experiment:

Freight from St. Catharines to Montreal	4c.
Ocean freight in cold storage	10c.
Broker's charges on landing	5c.
Broker's commission	1c.
Cost of package and packing	5c.
Total per case	25c.

As the fruit only realized 25c. per case of 7 lbs., it only just cleared expenses without any returns for the grower.

These figures, I presume, only refer to shipments in small quantities, as in the Report of the Dairy and Cold Storage Commission, 1910, it is stated that to encourage the export trade in early apples, peaches, etc., in cold storage, the ocean freight rate on boxed fruit shipped to Great Britain has been reduced to 25s. $6.25) per ton measurement; whilst in the case noted, allowing 166 cases of 12 lbs. each to the ton, the ocean freight works out at $16.60 per ton.

It would appear, then, that these figures relating to cost of freight, etc., and prices received for previous trial shipments, do not carry sufficient weight to prove we cannot compete in the British market.

My reasons for saying this are:

1st, The experimental shipments have been in small quantities, and, therefore, have not received as good freight rates as would large shipments.

2nd, They have in no case arrived on the market, in what could be called

Part of Haileybury garden.

"perfect" condition, owing to "lack of color," "breaking down" or suchlike, and consequently, could only be classed as second grade stuff by the commission brokers.

3rd, They have in all cases been shipped to markets where the most disadvantage would be encountered. I mean by this, that, as a rule, such markets as London, Glasgow and Manchester are more heavily supplied with a better class product than other cities and there is a consequent delay in distribution which is not met with in the markets of the smaller cities. It is also well to note here, that many of the large brokerage firms on these markets act as supply firms to commission men in the smaller cities and towns, thus adding to the cost of selling the produce.

There is not the least doubt that this combination of the commission men is detrimental to the interests of grower and consumer alike.

Mr. C. A. Dobson, of Jordan Harbour, who has been shipping peaches to the British market this season, gives it as his opinion that the English Commission Fruit Brokers are some of the shrewdest men to be found in the world, and that they are the controllers of the situation.

There is no doubt of this as far as the private individual is concerned.

It has been well known to English market growers for many years, that the large markets of that country, such as Covent Garden, London, Glasgow, Aberdeen, Manchester around which the larger commission firms locate, are more liable to slumps and consequent low prices, than are the smaller inland cities and towns.

I know from experience that on many occasions when a slump has been proclaimed in London and shipments thereto barely paid expenses, prices in towns like Hull, Leicester, Nottingham and Sheffield have been good, and the demand brisk, the London slump being simply the result of bad distribution by the large salesmen.

The South African growers and Tasmanian fruit men, realizing that their success on the British markets depended on the quick and systematic distribution of their produce appointed government distributing agents in London to dispose of their shipments, and so prevent the brokers controlling the prices. I would like here to point out another thing, which I think has considerable bearing on the South African growers' success, I refer to the interest taken by their governmment in all things pertaining to fruit or vegetable growing. On looking over a copy of the Transvaal Agricultural Journal for April, 1910, I found the following published for the information of their growers.

GOVERNMENT NOTICE No. 977—DEPARTMENT OF AGRICULTURE AND FORESTS.

"Supply of Box Material for Fruit Industry.—It is hereby notified for general information that a contract has been entered into by the Harden Heights Wattle Company, Limited, of Harden Heights, Natal, for the supply of fruit boxes. . . . to bona fide fruit farmers in the Transvaal during the period ending the 30th June, 1910, at the following rates: 15 in. x 9 in. x 2 in. at 1.125d. each. Other sizes are also quoted, also material of which to be constructed is specified."

This notice is signed by the Minister of Agriculture.

J. LOCKIE WILSON: Is the material for these boxes given free to the farmer?

G. COOPER: He has to pay 2 cents each and piece them together.

J. LOCKIE WILSON: Fixed as between the producer of the box and the Government?

GEO. COOPER: Yes; the Government goes further than the fixing of the price: They also lay down the material of which the boxes are to be made.

J. LOCKIE WILSON: There is no cost to the Government beyond making the arrangement?

GEO. COOPER: No.

Guernsey, Channel Island tomato growers have a central packing house for their produce, and also their own distributing agency in London.

This question of economic distribution is the important point, on which, I believe, hangs the ultimate success or failure of the shipments of any of this country's perishable vegetables or fruits to the British market.

It is a point of such vast proportions, that it is beyond the power or means of the private individual to fight it. But surely where the welfare of the whole community is at stake it is not too much to expect the Government to provide the assistance requisite to success.

Now, as to how we might attempt "to make good" on the British markets.

To start with, I would establish central packing houses in the various districts of the Province suitable for this and allied industries, introduce in connection therewith standard size packing boxes, etc., fix standard grades and weights, for the packing of the various vegetables and fruits, placing expert packers with a superintendent in charge of the work.

The cost of upkeep of these packing houses to be borne, say, one-third by the Provincial Government, and two-thirds by the growers using them.

Each grower's produce should be graded and packed separately, branded with his name, and location, and number of the Ontario Government Packing House, also date of shipment. This would enable liability to be fixed in case of delay, advertise the section growing the produce, give each grower credit for his own produce, and so help to create a healthy spirit of rivalry, which would, possibly, result in an improved class of produce.

At present, the loss of the grower's identity is a sore point in co-operative packing.

All produce should be shipped by the most direct route and under conditions most suitable to ensure its arrival on the markets in first class condition.

Instead of consigning the produce to one centre in Great Britain, have four distributing agencies, in the north, south, east and west of that country with a Government agent in charge.

Northern Agency could be at Glasgow, and produce be shipped there direct by Allan Line and distributed to the North of Glasgow by the Caledonian Railway to such cities and towns as Perth, Dundee and Aberdeen, and south of Glasgow via Glasgow and South Western Railway to the large manufacturing centres as Paisley, Greenock, Ayr, Carlisle, Durham and Newcastle-on-Tyne.

Southern Agency at Bristol. Produce shipped there direct via C. N. Railway Co.'s boats, thence by Great Western Railway to Worcester, Hereford, Bath, Gloucester, Birmingham, Wolverhampton, Dudley and the Welsh towns of Cardiff, Newport, etc.

Western Agency at Liverpool. Ship produce by C. P. R. Co.'s, steamers direct, thence by London and North Western Railway, Midland Railway and Lancashire and Yorkshire Railway to such large manufacturing centres as Manchester, Halifax, Bradford, Leeds, Sheffield, Oldham, Derby, Leicester and Nottingham with their teeming populations of factory operatives.

Eastern Agency at London. Ship produce by Allan Line steamers direct, thence via Great Eastern, North Eastern and Great Northern Railways to the cities and towns of Lincoln, Norwich, Yarmouth, Hull, Peterboro, York and Scarborough.

The agent in charge of each district to be responsible for the prompt distribution of all consignments, to render sale returns and collect all payments, and remit the same to the shipping warehouse concerned.

That there would at first be obstacles to the working of such a scheme as here outlined, there is no doubt, but with Government support and energetic pushing I see no reason for failure.

There is one other draw-back mentioned by Messrs. Monro Ltd., as militating against success in shipping tomatoes to England. This is the "length of journey" and "handling in cold storage." The first is, I fancy, not of nearly so much importance as the cold storage question, or rather, the question of the correct temperature at which tomatoes should be kept during transit.

It is clear that the tomato cannot be successfully shipped the distance we

require to send it, if gathered in a ripe, or even half ripe state, without the employment of some method which will retard ripening and decay. The only method which will do this at present, is pre-cooling and cold storage. The tomato is, in its natural state, the product of a hot climate, and, to-day, after years of careful selection of types suitable for our climate, both the plant and fruit are badly damaged by the slightest frost, and even by cold winds, which cause breaking down of the plant cell structures.

Similar damage appears to result to this fruit after having been any length of time in cold storage which has a tendency to cause the fruit to sweat and "break down" on exposure to a warm atmosphere, such as prevails in the average store when exposed for sale.

It is interesting to note in this respect, that a trial shipment of cucumbers placed in cold storage on the Royal Mail Steamer Briton by the South African growers last year, was an entire failure owing to their "breaking down" on exposure for sale in Covent Garden Market, London.

It is the opinion, based on experience, of many market growers and salesmen, and also, I see by an article in the Market Growers Journal of last week, the opinion of Professor L. C. Corbett, that with certain types of vegetables, cold storage is unsuitable when employed for any length of time.

The Canary tomato is grown in the Canary Islands, which are situated off the West Coast of Africa to the South of Latitude 30, with a climate somewhat similar to that of Northern Florida. This tomato is shipped to the British markets in large quantities, in cases of 48 to 56 pounds each, and takes from 5 to 6 days by steamship in transportation. Cold storage is not used. Success in transportation and arrival in good condition is ensured by gathering the fruits at an immature stage of ripeness, wrapping each fruit, and packing in layers in granulated peat moss in tight cases.

It is claimed for this system that the peat moss packing promotes even ripening of the fruit, by ensuring an even temperature during the voyage, whilst it also acts as an absorbent taking up any moisture which may be given off by, or surround the fruit during transit, and which would, otherwise, have a tendency to set up decay.

The stage of ripeness at which to pack would be, at first, a matter for experiment. I would gather the fruit in a dry condition at various stages of ripeness, some when just showing a tinge of color, another batch a quarter ripe, another, half ripe, pack exactly as Canary Island fruit, but in boxes only to contain 8lbs., store in a temperature of 60° for 10 days (about the time taken to reach market) open up, and note results.

In England I have ripened tomatoes, which were gathered when showing a tinge of color in 8 to 10 days, by wrapping in tissue paper, packing in bran in tight boxes, and storing in a greenhouse with an even temperature of 60°. The points necessary to ensure them coming out in good condition are to see that the fruit is gathered, wiped and put in the box in a perfectly dry condition.

Having regard to the fact that experimental shipments of tomatoes made in cold storage have not been satisfactory, also to the fact that commercial shipments in quantity are annually being placed on the British market from the Canaries without cold storage, it would appear to be advantageous to carry out some experimental shipments on the Canary Island system, as probably being productive of better results than have hitherto obtained.

In conclusion, I would state that wishing to have first hand information on

several points, raised on the experimental shipments made, such as the statement that the months of September and October were a bad time of year at which to ship, etc. I prepared a list of questions and submitted them to four firms of Commission Agents in the localities suggested as places for agencies in England.

The questions and replies are as follows:

T. Adams, Bristol.

1. Q.—At what part of the year have you the greatest demand for tomatoes?

A.—June, July, and August.

2. Q.—Is the supply always equal to the demand?

A.—Supplies drop off about end of August, and a good class of tomato is in demand through September and October.

A desirable package for local market.

3. Q.—Supposing our Growers could ship a first-class pack of tomatoes, averaging 6 to the pound, packed in 6 or 12 lb. boxes, in layers, each fruit wrapped like box apples, about what price would you think them worth according to time of year?

A.—If packed without packing, in our opinion weight would not want to exceed 8 lbs. in any single box. Prices then of first class fruit would realize during September and October from 2s. 6d. to 3s. 6d. per dozen lbs.

4. Q.—What would be the chance of success with a grade packed similar to Canary Island Tomatoes?

A.—There would be a demand, but prices, probably, would not be so good.

5. Q.—What chance would tomatoes shipped in late June, July and August packed as either above packages, stand in your market at that time?

A.—See reply to No. 3.

6. Q.—What do you estimate carriage from Liverpool to your station, and commission per 100 lbs. would be?

A.—By steamer from Liverpool to Bristol 11s. per ton. By rail 28s. 10d. per ton. Our commission for selling 5 per cent.

7. Q—What weight of fruit is contained in the (1) Canary Island package. (2) Spanish package.

A.—(1) 48 to 56 lbs. (2) 1 package 16 boxes, containing about 7 to 8 lbs in each box.

8. Q.—Could you handle direct consignments in quantity for your district?

A.—Yes. But would suggest medium consignments at first.

BARAGWANATH BROS., LIVERPOOL, BIRMINGHAM AND CARDIFF.

1. Q.—At what part of the year have you the greatest demand for tomatoes?

A.—During the summer months.

2. Q.—Is the supply always equal to the demand?

A.—Varies according to seasonable conditions, usually yes.

3. Q.—Supposing our Growers could ship a first-class pack of tomatoes, averaging 6 to the pound, packed in 6 or 12 lb. boxes, in layers, each fruit wrapped like box apples, about what price would you think them worth according to time of year?

A.—From 2s. to 3s. per 12 lb. box.

4. Q.—What would be the chance of success with a grade packed similar to Canary Island Tomatoes?

A.—Should say very fair.

5. Q.—What chance would tomatoes shipped in late June, July and August packed as either above packages, stand in your market at that time?

A.—Fairly good.

6. Q.—What do you estimate carriage from Liverpool or Bristol to your station, and commission per 100 lbs would be? Please reply as to Birmingham and Cardiff also.

A.—About 25s. per ton Bristol to Liverpool: about 15s. per ton Bristol to Cardiff: about 15s. per ton Bristol to Birmingham. Tomatoes of the smooth sorts would meet with the greatest success.

7. Q.—Could you handle direct consignments, in quantity for your district?

A.—Yes.

MOODY AND EVANS, NEWCASTLE-ON-TYNE.

1. Q.—At what part of the year have you the greatest demand for tomatoes?

A.—August and September, because cheaper.

2. Q.—Is the supply always equal to the demand?

A.—June and July short.

3. Q.—Supposing our Canadian Growers could ship a first-class pack of tomatoes, averaging 6 to the pound, packed in 6 or 12 lb. boxes, in layers, each fruit wrapped like box apples, about what price average would you think them worth according to time of year?

A.—5 pence June: 4 pence July: 3 pence August per lb.

4. Q.—What would be the chance of success with a grade packed similar to Canary Island Tomatoes?

No reply.

5. Q.—What chance would tomatoes shipped in late June, July and August packed as either above packages, stand in your market at that time?

No reply.

6. Q.—What do you estimate carriage from Liverpool to your station, and commission per 100 lbs. would be?

A.—Carriage would depend on quantity, apples are about 20s. per ton. Commission 7½ per cent. inclusive charge. Less for large quantities.

7. Q.—Could you deal with direct consignments in quantity for your district and north?

A.—Yes.

This has been an abnormal season for tomatoes and is no safe guide. *Usually* Guernsey, and Jersey tomatoes in September and October drop to 2d. and 1½d. per lb. This year they have made 3d. to 4d. here for same period.

Canary Island tomatoes are now making here about 3d. and 3½d. lb., wholesale for best quality.

A Heavy Crop.

The need appears to me to be the beginning of season, June and July.

J. Lockie Wilson.—This is one of the most comprehensive papers we have heard and that is saying something when you consider the many excellent papers prepared for these Conventions. We are under a deep debt of gratitude to Mr. Cooper for the thorough manner in which he has investigated this intricate problem.

E. E. Adams.—The paper is a very able one, discussing the question from the standpoint of the growers as well as the consumer, but, as a large grower of tomatoes, I do not see anything in it to encourage me to grow tomatoes for the British market.

F. G. H. Pattison.—I agree with Mr. Adams; where such a large amount of machinery is necessary to accomplish so little the game is not worth the candle. We are in a totally different position from the growers in the Canary Islands, the Channel Islands or South Africa. These men must cater for the British market

because they have no other. To-day the grower in this country has a very good market at home, not only for fresh but for canned tomatoes. According to this paper it is necessary for us to revolutionize the whole situation. Those who go in for this market will have to grow a different kind of tomato altogether, for the ordinary kind are not suitable for the British market. Mr. Cooper has pointed that out by giving some varieties that might be suitable. He referred to peaches. I had a long interview with Mr. Dobson the other day, and he says there is no profit at present in growing peaches for that market. Taking the care and worry into consideration the growers do not get a cent more than if they had sold them in their own markets. Consequently, only two firms, practically, are shipping to the English market. The situation is even worse with tomatoes. You will have to educate them to receiving a tomato they are not accustomed to, and it is hard to get them to change when they have something they like. They rarely change from an old to a new kind. So much difficulty is involved that I do not think the question will be taken up seriously by tomato growers of this country. Mr. Adams has well expressed it when he says there seems to be nothing in it commercially for them.

A. H. Tomlinson.—What time of the year does the Canary Island Fruit reach England? The English fruit is picked from the vines, and that means is has a much better flavor than the fruit you send from here. I don't see any possible chance for a tomato grower here shipping to the old country to make a profit. I have been a tomato grower in Devonshire, England, and over there they have difficulty making both ends meet. I worked at Jordan Harbour, the year before last, and an experiment was made sending tomatoes from there, but it proved useless.

Geo. Cooper: My paper is not written with the idea of revolutionizing the tomato industry, but, if the time ever arrives, that market may be useful. Mr. Tomlinson will back me up in the statement that if there was a more economic distribution of products in England to-day there would be markets for all we could send. It is wholly a matter of distribution. Even to-day in Canada your large towns are not your best markets. You will get lower prices in the large cities and more slump prices than in the small. My paper was written with the idea that there was a chance for the shipment of tomatoes to the Old Country if the suitable type is produced, and also to show that there are thousands of acres of land for new growers to utilize for that purpose without calling upon our old and established growers to sacrifice their present markets. I say further with regard to the complicated machinery Mr. Pattison refers to, that that complicated machinery is wanted not only for the vegetable growers of this Province but for the fruit growers.

J. W. Rush: Cannot these tomatoes be shipped to the North-west, where there is a better market and much higher prices than there are in the Old Country, because every shipment so far as I know, sent over there was generally sold for about 5 pence less than the cost of sending them. If you can get 25 cents more than what they cost by sending an 8-lb. box up north I think that would be a better scheme. I am pleased with Mr. Cooper's paper, but there is a better market in the northwest for tomatoes and they will get up there in good shape and command a higher price.

Geo. Cooper: I don't see why the organization could not be used for the home market as well as for the distant market. One important point is getting the railway companies to give us fair treatment. That could be accomplished by working

up a strong organization, as Mr. Baker puts it. It is simply a question of an organization with Government backing instead of the private man having to put his hand in his own pocket and having to fight the battle.

PROF. MACLELLAN: I have some samples of these varieties, English and American here, which I brought with me. I will get them out this afternoon and you can see them. You will no doubt learn more by seeing than by hearing.

NEW METHODS IN SMALL FRUIT CULTURE.

W. J. KERR, OTTAWA.

The subject selected for me to speak on is a somewhat difficult one. The failure of crops of small fruit is oftentimes due to the running out of the stock. It

Montreal Melon, Gorman type.

is true of strawberries. Some years ago the old Williams strawberry was the best grown, but to-day you do not hear much of it; it was formerly very successful over a large area. If we follow the advice of Professor Craig we will bring to a state of perfection the varieties we already have, and my recommendation to anyone going into the small fruit business is to stick to the tried varieties and keep up their vigor. We are offered different kinds every year, and the most wonderful claims are made for them. If we were to follow up the idea of keeping up the vigor of those we have it would be much better. A fairly successful farmer

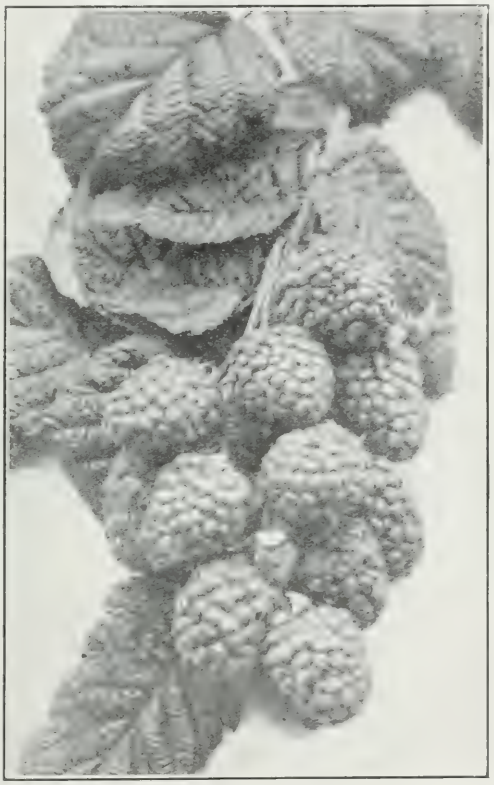
went into the breeding of pure-bred Ayrshire cattle. He bought a stock at considerable expense, but after a few years went out of the business as being unprofitable: he could not find a market The reason was he was a poor feeder He sold his pure-bred cattle, and went back to ordinary scrubs. Some of these pure-breds he had were very deficient in size, and under his treatment were very inferior cattle, but under the care of skilful breeders they became worthy of the breed to which they belonged and made their mark. If some up-to-date grower were to take hold of the old Marlborough raspberry and give it proper attention it would soon show wonderful development. If we stick to our strawberries and keep them up by proper breeding, we will do better than by changing to new varieties. I do not object to the introduction of new varieties, but we should have some assurance from reliable sources that they are of real value.

Strawberries.

Strawberries are the first small fruit to ripen, and are probably the most important if properly handled. The first thing to be considered in connection with the growing of strawberries is to have suitable soil. All small fruits, especially strawberries and raspberries, require a great amount of moisture. They come in a season when we have our greatest drouth as a rule, from the middle of June until the first or the middle of August. In order to preserve moisture for these we require to do considerable cultivating, but before preserving the moisture, the first step is to get into the soil as much as possible. It is advisable to plow the ground in the fall, although it is much easier to plant in freshly plowed soil than in what is plowed in the fall, particularly if it is of a fairly heavy nature. The plowing of the soil in the fall leaves a rough surface. It is left in a condition to absorb and hold fall rains. You are aware, of course, that you will find very much more moisture in a summer fallow than along a roadside or in a meadow. If you take a handful of ordinary sandy loam soil, wet, and press and lay it down in the sun and come back after a while, you will find the moisture has all gone out of it, while the cultivated soils will retain the moisture much better. In the first place the particles of soil allow the moisture to be passed along from one to the other and the air gets in very rapidly and soon dries it up. In the other case where the particles are not packed so firmly the moisture does not leave it so readily. Plowing in the fall allows the maximum amount of moisture to get in and then frequent cultivation during the season retains it. The best field of strawberries I ever raised were grown on a clover sod which had been seeded the year before and a crop of clover taken off. The ground was plowed and cultivated and the sod thoroughly rotted. The clover roots proved very beneficial.

The next point of importance is variety. In some sections around the Niagara district they grow the Williams strawberry more largely than all other kinds put together, and they no doubt know what they are doing and find it the most profitable and suitable to their conditions. Around Ottawa we find the Williams one of the most unprofitable crops, bringing out the point that while one variety may be profitable in one section they may be unprofitable in another. While we can get better crops of Williams it is a very unmarketable crop in our section, due to the white pith of the berry. I do not want to recommend any kind particularly, but the ones that are the most profitable are those I would grow most largely. We frequently hear a man say, "A strawberry is a strawberry, and if we can get something that produces a big crop we will grow it." Quality in this case is a second

consideration. I don't agree with that idea for the reason that if a dealer at the beginning of the season sells a few crates of Excelsiors his customers use them and find them very sour, and they last a long time with them. On the other hand, if he had something sweeter and nicer flavored they would use them up quickly and come back for more, and the better the quality the greater will be the demand; if people get something of good quality they will pay the price. One of the most successful growers around Ottawa still sticks to the old Cresent seedling; you all know it. I think if she were to grow some other variety a little better in quality she would make just as much money with her intensive methods of cultivation. I remember driving into town one Saturday night, reaching Bank Street about 10.30, when most people ought to be home and a good many were. Many were taking baskets



Raspberries.

of berries home for Sunday. I drove up to one store with my load, composed of some particularly choice ones and asked the retailer if he required any more berries. He said he had a lot in his store and they would not keep till Monday. I said I had something nice in the rig and would like him to see them. I sold them at 10 cents a box and he put a card in the window "15 cents a box." It was amusing to see the people buy these when the others met with a slow sale at two for a quarter. That is a sufficient proof to show that people in cities are willing to pay a good price for a good article if they can get it. It is customary (perhaps not around here) for people to put in a field of berries and crop it, and after they have taken the first crop off to take out the plants from that and start a new plantation. I don't think that is wise from my personal experience.

We can well afford to have what we call a propagating bed where each spring we select from a few of the most promising looking plants a few good, strong, vigorous, well-developed plants, set them out, restrict their plant-making to a certain extent and grow from them. Their vigor is thus maintained and they make a very strong growth. If left alone they will perhaps make a good many young plants. That is a point I will treat of a little later, for unless we restrict their plant making they will make too thick a growth of plants and we don't get the results we otherwise would have. Another thing is to set out these plants early. When the winter snows have melted and the resulting moisture has been stored up in this fall-plowed soil, and the soil is cool, better results are obtained if we plant then, and with much less loss than if we left it till later, when the ground has become more or less dried out, and the sun is hotter. Not only that, but the plant has lost a certain amount of vitality. My experience is that if we sow our plants before any growth has set in there is no loss, and it is better for next year's growth. In preparing the ground, I like to work the surface thoroughly and get it as fine as possible, but the sub-soil should be packed firmly, especially if the soil is light.

In some soils we get just as good results from spring as from fall plowing. If the soil is inclined to be hard it is absolutely necessary to have it turned up in the fall. If it is a loose sandy soil the frost packs the particles more closely together and brings the moisture up to the surface of the plants. It is necessary to prevent the moisture from passing from particle to particle and going out in the air. Just as soon as the plants are set (and if you are setting a very large acreage I wouldn't wait till they are all set) it is worth while to run the cultivator between the rows and loosen up the surface to keep in the moisture. We keep it there by cultivating as often as possible, especially after every rain. We are all aware that strawberry plants, particularly all the plant-making varieties, will make enough plants to give us good results if allowed their freedom. Take Crescent seedlings—we may plant them two feet apart in the row and the rows four feet apart, and when the fall comes our ground is practically all covered with plants as thickly as they can grow. It is along the edges of the rows that we get our best berries and the heaviest crop; in the centre of the bed we get practically no berries and they are not nearly as good as the others. That means we should have as many edges as possible: in other words we should not allow our plants to get so thick in the centre of the bed that there is not sufficient root room: so thinning is advisable. A strawberry grower at Ottawa follows a practice of going over her rows when the first runners have come out, setting them up with a little chunk of dirt which holds them in place and they take root. While this is considerable work it means money, and I believe that in strawberry growing, particularly, every dollar spent in intensive cultivation means $5 gain. These runners are set a sufficient distance apart.

A Member.—After the plant has made a little growth, it throws out a runner which some advise you to cut off.

W. J. Kerr.—Some years ago I used to think the same myself, but in my experience I don't think that the 7th and 8th runners are as good as the first one: but I do think that the second and third runners are better than the first, because the parent plant has become established in the ground and is in a position to feed them more strongly than the first, and, no doubt, makes stronger plants of them. For a number of years I have not covered the plants at all in winter. We get a pretty heavy snowfall around Ottawa, which comes early and stays late. I would

recommend for your districts the covering of your plants in the fall. If you have not an early snowfall, there is certainly danger of winter injury. I consider a light-colored, bright, clean straw the best covering for all late varieties; being light-colored it is a better reflector for the sun and it helps the plants to start earlier in the spring. On the other hand, if our berries are a later sort, and we are willing to take chances with the frost, then we prefer a covering of a darker color, marsh hay or something of that nature. Being darker it is a more rapid conductor of heat and they will thaw quicker.

A MEMBER.—Would you recommend a light mulch?

W. J. KERR.—I would not put it on until the winter sets in. I would prefer a light covering at first, and when the winter sets in well, a heavier one. Straw is pretty expensive and so is labor, and on this account, where snow falls early many growers take chances and leave their plots unprotected.

A MEMBER.—Does not the straw protect them from dirt in the summer?

W. J. KERR.—We frequently get a heavy rainstorm that dirties our berries and makes them unsalable to our best customers. They are then sold to the Italians. If we are mulching we have to pull off the straw and leave it between the rows. The berry stems rest on the straw, which keeps them clean and also helps to keep in the moisture. Mr. Cowan went through our plantation some years ago where the grass was growing thick and noticed some of the best berries he ever saw. If the ground is very moist it might be permissible to let weeds grow up in the spring, but where the mulch is pulled off in the centre of the rows it is out of the question to cultivate and the weeding must be done by hand. This is one objection.

A MEMBER.—You consider snow the cheapest covering?

W. J. KERR.—Yes, but it does not protect your berries in the spring or in the summer. It does not stay long enough. There is another feature (perhaps you all practise it up here, but I think I am the only one doing it around our country), and that is the use of the berry pickers' ticket. We tried a great many ways of keeping check of the berry pickers during the season. Every berry picker is supposed to be honest, and it is not unusual when you come to settle with them at night, for them to claim allowance for four or five baskets more than you have credited them with. To overcome this trouble we tried a lot of schemes. Three years ago we had a berry-pickers' ticket made,—an indestructible one that you can put in a pail of water if you wish, without injuring it. They are in different denominations, 1 cent, 6 cents, 12 cents, 24 cents, a dollar, and so on; since we have started to use these tickets we do not have any disputes. When a picker comes in with six baskets he gets a 6-cent ticket, and if he has seven he gets a 6 and a 1, and so on, up to 100, when he can change them for a one dollar ticket, and when pay time comes they get the money for whatever tickets they have, and, if they lose their tickets, that is their own look out. It relieves the grower of a great deal of trouble. Some imagined we tried to beat them out of some money every time, but now they are paid for their tickets. We have been using the same tickets for three years, and they are good for ten or fifteen years more. The cost is nominal.

A MEMBER.—We keep change in 5-cent pieces and coppers, and after handling the berries and putting them into the baskets, each picker is paid for the berries he has picked. As the boys come in with ten or fifteen coppers these are changed for silver.

F. G. H. PATTISON.—On some berry patches they demand a cent and a half.

W. J. KERR.—In that case, with the ticket, if they pick 6 baskets they would get one six-cent ticket and three ones. Sometimes we have to raise our price—I paid 2½ cents once; if we had not they would have gone and left the berries in the field.

A MEMBER.—After you set the plants do you shorten the roots?

W. J. KERR.—Yes if they are very long. I don't consider it necessary to put them in longer than 3 or 4 inches; sometimes we get them 8 or 9 inches long. The difficulty with the long roots is to get them down straight; if they are put in in a bunch they will not do well; some people who don't belong to the Ontario Vegetable Growers' Association, and who know everything, plant their berries the same as a cabbage—punch a hole with a stick, and force them in. Some of the roots will do well, but others, which do not come in contact with the soil, rot, and impair the life of the plant, and it frequently dies. Our method is to plant with a spade—you may have better methods. When the land is prepared we use binder twine stretched from one end of the field to the other, and a man goes along this binder twine and digs about 6 inches deep, pressing it over. This requires a little work, and there is a chance that the whole may be a little deep or not deep enough. A boy follows with a basket of fifty plants on his arm with the roots loosened. He shakes the roots out and drops them down the back of the spade, which is held by the man, who draws his foot away and packs the soil firmly about the roots, and is careful not to cover the crown.

A MEMBER.—Do you put the spade in straight or on a slant?

W. J. KERR.—Straight, because they will suffer less from drought. If you put your spade down too far you will leave a hole at the bottom; you should not let your spade go down more than 4 inches, as a rule; then the plant will go to the bottom of the hole.

A MEMBER.—I suppose your ground is worked up very fine—you have to do that; do you find any trouble from earth falling in?

W. J. KERR.—Not unless it is very dry. If the ground is dry on top you will have some difficulty. If we plant early the ground is not very dry,—if a little dry sand does sift down into the hole, and there is good cultivation and the roots are moist, the plant will not suffer. If it is so dry that a whole lot of sand falls down I would leave planting until next year.

A MEMBER.—What would you call early?

W. J. KERR.—Just as soon as the ground works up nicely,—it depends upon the season. I have planted on the 5th of April with excellent results. In other years there has been a foot of snow on the ground on that date.

A MEMBER.—What do you consider early there?

W. J. KERR.—Toward the latter part of April. The frost has been all out of our ground by the 10th of April; in other years the ground was then covered with snow.

A MEMBER.—Do you prefer planting when there has been growth?

W. J. KERR.—I prefer to have them absolutely dormant. Some years ago I sent to one of the best known and most reliable growers in the States and got some plants. They came with scarcely any foliage at all and very early. Our ground was not in a condition to plant, the frost not being all out. I got the plants set out, and although they came from a distance, there was practically no loss. I am strongly of the opinion that we cannot plant too early, if the ground is in good workable condition. We do not trim foliage except what is old and very little of

that. I like to keep the straw on until they make a good growth. It would be well to leave the straw on until you are going to plant, if you plant early.

I am not acquainted with your system of handling berries, but the best way is to furnish each picker with a basket to carry on his arm, it is suspended over the shoulders, and with it a picker can pick berries with both hands. A good many growers in our neighborhood, however, do not use them. A man goes amongst the pickers and collects the baskets, giving each one his tickets; this saves a lot of running over the field. In other cases they are given a crate to fill, but this is not satisfactory, as these are placed in different parts of the field, and being left in the sun all day the berries are certainly not in the pink of condition. I prefer to take them in as fast as they are picked. It is better to crate the large berries apart

Cabbage.

from the others, and whatever you get for the inferior ones is clear gain. We cannot pay good pickers too much. It is better to pay a good picker a cent and a half than poor ones a cent. I had a picker once who never got over 20 cents. I watched him and found that two berries went to his mouth for every one that went to the basket. On the other hand, we have little girls nine and ten years old, who will make $1.50 a day at a cent and a half a basket.

I believe that one crop is more profitable than more. We had a field this year off which we had taken two crops, and could not get time to plow it up, so it was left, and we took off the third crop this year. We sold off this piece $200 worth of berries, and we could not have grown $100 worth of vegetables on it. They came in exceptionally early, and we got 18 cents a basket for three days' picking. If the early market is of any value to you, the old bed will yield you earlier fruit than the young bed will.

F. G. H. Pattison.—Some of the most prominent growers in Ontario take three crops regularly.

A Member.—What is your average yield per acre?

W. J. Kerr.—An average yield, taking one year with another, would run somewhere in the neighborhood of 5,000 baskets. Of course we often get a great deal more than that; sometimes we do not get as much. Occasionally—and we have had some experience of that in the last few years—we get nothing. Some varieties yield very much more than others. For instance it is profitable to grow Marshall's with intensive cultivation, if you can get a special price.

A Member.—Is Brandywine a good yielder?

W. J. Kerr.—I discarded it some years ago; it has not got a good color.

A Member.—This dry weather affects all varieties?

W. J. Kerr.—Yes, some of our growers were very badly affected by bad weather. I estimate that I lost a year ago a thousand dollars from dry weather.

A Member.—Do you use irrigation in the ripening season?

W. J. Kerr.—No, not yet. If we were growing on the same plots year after year, irrigation would pay us.

A Member.—Do you find you grow as good berries on the same land when you have had other crops in for a few years?

W. J. Kerr.—Yes, I prefer to change around. Berries are chiefly water, and we must have our land in good condition or we cannot get that crop of water out of it.

A Member.—Strawberries seem to take something from the land that is very hard to put back. My experience is that we never could grow them as good again on the same land.

W. J. Kerr.—We have frequently gone back after an absence of a couple of years and had good results.

A Member.—Do White Grubs bother you much?

W. J. Kerr.—Not to any extent; I have seen them do a great deal of damage, and they are difficult to handle when they once get in. We can overcome that by planting in soil that has not been in sod very long. The grub requires two years in the soil, and the second year it does the most damage; if it has only been in sod one year it is not likely to do as much damage. The beetle that lay the eggs get into that sort of land.

Raspberries.

The next subject is raspberries. All who are not interested in any particular variety will agree that we have at the present time on the market three profitable commercial berries: Marlborough for early, Herbert for mid-season, and Cuthbert for later. Some of you may have other kinds that may succeed better under your conditions. These are the three varieties which, as a rule, are the most profitable. The Herbert yields by far the most fruit, and it will not be long until it will become the great commercial berry of the Province. I remember Mr. E. D. Smith buying a crate of raspberries once, in which there were some Herberts. This was on Friday afternoon; they were shipped 60 miles by train, and when the crate was opened on Monday afternoon not a dozen berries of the Herberts were spoiled, while the others were a total loss. There were no Cuthberts in the lot, however. Some of the nurserymen on the other side have been running down that berry. I was told to-day by one of their representatives that he had been authorized by his firm not to sell it, making out that it was not a desirable variety. In Canada

to-day there is no other berry that yields as much fruit under similar conditions. If any man can find a berry at any of the experimental stations in Canada or the States that will grow as large a crop as it I will give him a thousand of the best plants he can find on our plantation, except the Stanley Plains. Six feet by three feet apart is not too much space to devote to raspberries. We find growing them in hills about six canes to a hill is the most profitable way to have them.

The Potash Syndicate of this city sent me last spring a quantity of fertilizer to use in connection with the growing of onions, strawberries, and raspberries. There was a picnic at my place in July for the growers around Ottawa, and I showed them three beds, one of which had a dressing of fertilizer, another of phosphoric acid and another of nitrogen, phosphoric acid and potash. I asked those present to point out the differences in them and no one could detect any. A week ago I went out on the ground and the plants were fully a foot higher where we had used the potash. In the letter I sent to the potash people I said that no doubt on light or poor soil the commercial fertilizer would be of value. I will now make a different report to them. We can get all the stable manure we want to draw from the city for the drawing, but it is a serious question except in the winter. I understand that in some parts they have to depend wholly on commercial fertilizer.

I believe in catering to the best class of trade. If we have an inferior article we sell to the Italians. It will pay us to produce the choicest we can and sell to the best people. We have two customers in Ottawa who pay the highest price all the time. I have not in two years asked a price that was refused. We have always got 10 to 20 per cent. more from them than from other people who try to beat you down. For preserving purposes I have not seen anything to equal the Wonderful. It is a short-rooted plant, and, therefore, if your ground is dry and hot you had better not attempt to grow it; it must be restricted as to plant making, because it exceeds the Crescent Seedling in this respect by about 50 per cent. If the soil is moist and you restrict the plant making, nothing will pay like the Wonderful. Many like a tart berry and are willing to put enough sugar in to get over that. People in Ottawa often ask for the little dark-colored berry they got last year. In a small way we have grown other varieties, Lucretia, Austin and Premo. We have had good results, large crops and good fruit. A grower in Campbellford had some this year $1\frac{3}{4}$ inches in length. Birds are very fond of them. If you leave a basket 20 or 30 feet away, the young Orioles will come and eat them. For canning and preserving there is nothing in the berry line that I like better. We plant them the same as raspberries and they grow in a line along the ground. In the winter they are lying on the ground and the snow covers them up.

Gooseberries.

There is a splendid field in Ontario for the growing of English gooseberries, if we have proper conditions. No doubt many of you have tried them and had dismal failures. Agents of nurserymen went through the country some years ago and recommended highly the Industry gooseberry. Farmers and others tried them, but mildew killed them out. Conditions similar to those in the old country are necessary. The first necessity is partial shade and not too much sunshine; the shade of young trees where they don't get too much sun is absolutely necessary. They need fairly moist and sticky soil; light sandy or gravelly soil is absolutely worthless for growing English gooseberries. They require pruning, but not as

much as the American varieties. They should be kept in check and not allowed to get too much root. Mr. R. B. Whyte, of Ottawa, grows a great number of English gooseberries to perfection, on a city lot. We can grow them if we have the proper conditions; if not we had better let them alone.

F. G. H. Pattison.—Have you used lime-sulphur at all?

W. J. Kerr.—No. The American berry is much stronger than the English and you get a good deal more wood: I believe they root more readily. The English gooseberries are more expensive, because the American varieties propagate from cuttings. Industry is the name of the red variety. I don't like the "Perfection"; it is very scraggy, but produced the last couple of years the largest berries I ever saw.

About co-operation in growing. If the growers got together and cut out the middleman they would get better prices. We should get as near the consumer as possible. If we had a representative to get in touch with the retailer, making sure that the retailer is financially responsible, we would get better results.

Why is it that we have such difficulty in getting labor. In the city we find plenty of young fellows, and if the flow from the rural parts to the city were stopped we would have all the laborers we wanted. They are not nearly so well off as they would be on the farm.

A Member.—They sell their labor at the point of least resistance. The most pay for the least labor.

W. J. Kerr.—When young men can get $5, $10, or sometimes $20 a week in the city they are attracted by it and leave the old farm behind. We should give the boys something of their own to induce them to stay on the farm, and let them keep the profit for pocket money. My boys are allowed a certain amount to spend as they like, although not foolishly, and have bank accounts. If the young men are given some interest in the farm or market garden, that would help very materially in solving the vexed labor problem.

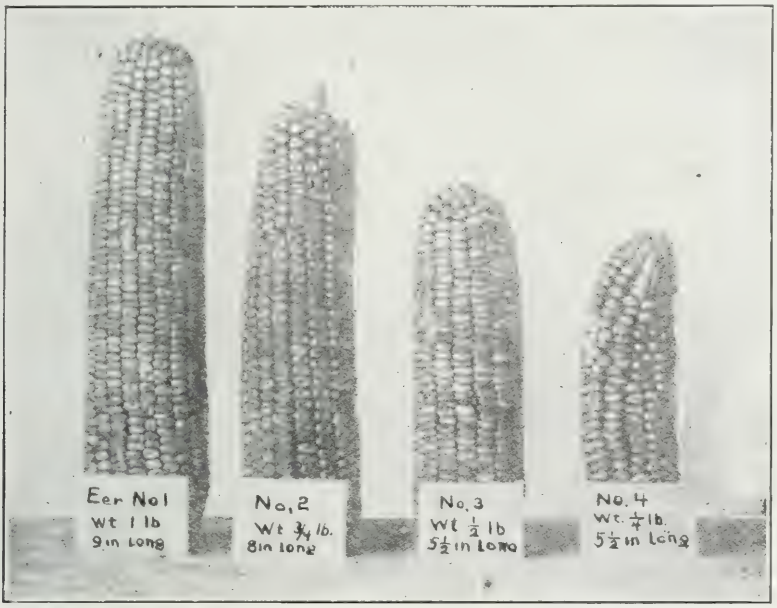
WHAT THE CENTRAL EXPERIMENTAL FARM, OTTAWA, HAS DONE TO ASSIST VEGETABLE GROWERS.

W. T. Macoun, Dominion Horticulturist, Ottawa.

During the twenty-three years in which experiments with vegetables have been conducted at the Central Experimental Farm, Ottawa, very few suggestions have come from vegetable growers as to what kind of work they would like to have done, hence those in charge of the work have carried on only such experiments as they thought desirable in the testing of garden produce.

The Experimental Farm System was established primarily to help the farmer, and while all Canadians have a right to ask for assistance, and should get it, the farmer, we consider, has first claim; hence during the past twenty-three years it has been necessary in planning our work to keep in mind the needs of the great majority of people who grow vegetables, namely, the farmers who, unlike those who make vegetable growing a business, are comparatively unfamiliar with the best methods of culture. The needs of the commercial grower have, however, not been overlooked and in the twenty-three Reports which have been published by the Horticulturist we believe that there is much which should have proved of value to the commercial grower.

The question of varieties is one in which both farmers and market gardeners are interested, for the farmer and amateur should have the varieties which are most suitable for table use, while the market gardener should have high yield, earliness, uniformity, and attractiveness as well. During the twenty-three years in which we have been experimenting, hundreds of varieties of vegetables have been tested. For some years a list has been published in the Annual Report, every other year, of what have been found to be the best. Our present practice is to test the varieties, each year, which we recommend, a few others almost or quite as good, and, in addition, the novelties offered by seedsmen, growing the latter for several seasons until we are sure whether they are better or worse than the varieties already tested, or, it may be, merely synonyms of them.



Types of Corn grown from the same seed. No. 1 only should be utilized for planting.

Trial shipments of tomatoes were sent to Scotland in 1907, which, with the information obtained at the time, proved conclusively, we think, that tomatoes could not be sent profitably to Great Britain. Varieties were grown especially suited for the trade there. As the tomato is an important crop it has been given considerable attention at Ottawa. Since 1900, work in selection has been carried on with the Sparks Earliana tomato to demonstrate, if possible, the importance of the farmer and market gardener selecting his own seed from year to year from individual plants. The C. E. F. strain of Earliana, which has now been grown by a number of experimenters, has been found to be in most cases earlier and more productive than other strains, demonstrating what can be accomplished by selection.

It is the aim of the Central Farm to develop extra early strains of all the important vegetables, as the earliest varieties are in most cases the most profitable to Canadian growers. One of the most interesting features of the work in this direction is the improvement which we are endeavoring to effect in the Early

Malakoff corn, an exceptionally early variety which was introduced some years ago from Russia by Prof. Hansen of the South Dakota Experiment Station. This variety is earlier than Early Cory, is much sweeter, and is very productive. The ears of the type are, however, rather small. We are selecting for longer ears and increased earliness, and have now some very promising strains. Some seed distributed to a few growers this year has given very satisfactory results. Early strains of Beans and Peas are also being developed. Our main object in this work is to demonstrate the advantage of careful selection of home grown seed.

Special attention has been given to the study of the potato, and many experiments have been conducted with this important vegetable. A bulletin on potato culture was published in 1905 giving the results of experiments and the methods of culture and the varieties recommended. So great was the demand for this bulletin that a new edition had to be published in 1910. During the past few years the question of change of seed in regard to potatoes has been studied and a paper was read before this Association two years ago on this subject. It has been found that the yield one obtains depends a great deal on where and in what kind of season the seed potatoes were grown and the kind of crop from which they were taken. Briefly stated, the results show that potatoes which are prematurely ripened by hot, dry weather do not make as good seed nor give as large yields as those grown where the weather is cooler and the potatoes do not ripen as rapidly or thoroughly.

Potatoes a little immature are better for seed than those which are well matured. In the paper referred to it was suggested that seed from Northern Ontario would give as good results as seed from the Maritime Provinces and we are glad to learn that this Association is now advocating obtaining seed potatoes from the Temiskaming District.

Testing to determine the relative earliness of varieties, freedom from blight, and selection to obtain strains immune from disease are other features of the work with potatoes.

Other experiments which might be mentioned are the testing of the relative immunity of late varieties of cabbage from rot, the Houser having been found to be the variety freest from disease for several seasons. For a number of years the varieties of garden peas which have been found to be the most promising have been tested side by side in one-hundred foot rows and the yields of green pods recorded. In this way the most productive from a market gardener's standpoint have been determined. The relative ability of different varieties of lettuce to withstand the heat in summer has been determined after several years' test, and the Iceberg, Hanson, and Giant Golden Hearted or Giant Crystal Hearted have been found to stay longest in condition. The testing of the keeping qualities of different varieties of celery has resulted in finding that French's Success, Triumph, and Perfection Heartwell are three of the best.

This year a small area of glass became available and we are carrying on a test of twenty varieties of tomatoes under glass. The test is not complete, but so far Dobbie's Champion is the most promising, with Livingston's Globe, Clipper and Industry next best.

Pamphlets giving information on Asparagus Culture, Celery Culture, Onion Culture, Mushroom Culture, Melon Culture, Ginseng Culture, and on How to Make A Hot-bed and Cold Frame have been published and been found much in demand.

There are many other experiments which might be mentioned, but those which are here recorded will give the members of the Association some idea of

what we are trying to do. It is our earnest desire to help the farmer and market gardener in every way we can.

There are no tillers of the soil who better earn the money they make than the vegetable grower. With his face close to the soil in the hot summer weather weeding and thinning his crops: none but industrious and enthusiastic men and those of great endurance can stand the heat and also cope with the many insects and fungous enemies which affect their crops, and through favorable and unfavorable seasons maintain a strong belief in and love for their calling.

J. W. Rush: Is there anything in ginseng culture to encourage the farmer to try that?

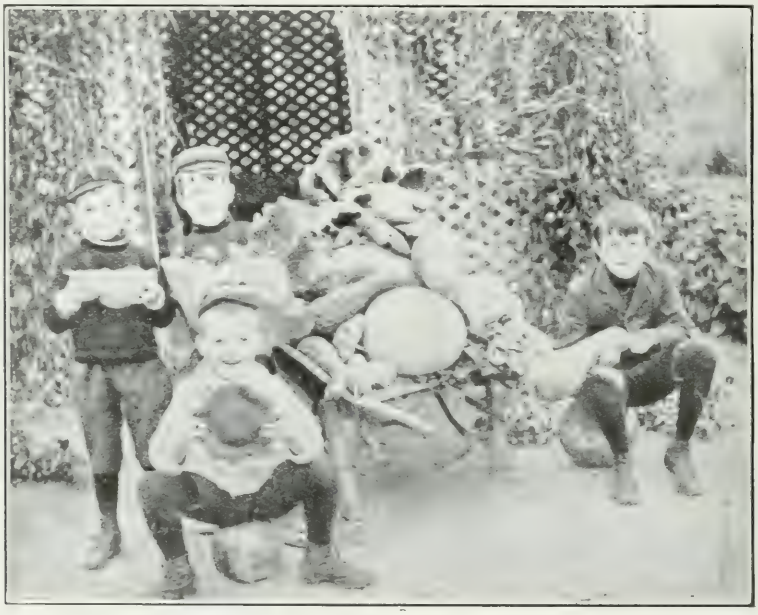
Prof. Macoun.—Some of the growers have made a success of it, but in the majority of cases it is unprofitable. No doubt great profits have been made, but there are so many things against the culture of ginseng that I would not advise the average grower to go in for it.

WHAT THE ONTARIO AGRICULTURAL COLLEGE IS DOING FOR THE VEGETABLE GROWER.

A. H. McLennan, B.S.A., O.A.C., Guelph.

Our work at Guelph is different from that at other stations for certain reasons. We have two things which they have not got, and that is the students and the students' residence. I give lectures twice a week from the middle of October till Christmas in addition to those given to the Macdonald College girls. I have about 10½ months of straight lecture work out of 12. That is rather a heavy handicap. Besides that, we have to provide vegetables for both residences, which means 600 or 800 people. Prof. Macoun's experience is the same as mine, and that is that you do not tell us what experiments you would like us to carry on. We are only too anxious to receive suggestions. You are in the business and it is from you the suggestions should come. We run up against a good many problems in our work. The more I look at it the greater necessity there seems to be for my department to pay more attention to indoor work. Our frost season is over about June 10th, and returns about September 5th. You know what a proposition it is to get early stuff to grow in that time. You send your sons to Guelph for from one to four years to learn all they can, and I want to help them to do this. At the present time I have not sufficient greenhouse room. I want every man, whether he is taking one year or four years to know the practical side as well as the theoretical. That is what we are there for. At home, of course, you have to figure on the dollars and cents, and while we have to do that too, still we have a little leeway. It is up to you to get us a little more. We have been working up there on methods of bench culture of tomatoes. Four years ago when the new houses were built with three benches in a house and six solid beds, half were put in with cement foundations with a depth of earth 6 or 8 inches and the other half ordinary beds. One-half had sub-irrigation and the other half surface. We worked for two years with surface irrigation and found that this system did not produce A1 fruit. It costs something to instal sub-irrigation because you have to use 2½ inch to 3 inch tile, but it more than pays for itself; it takes less time if you have water pressure of any kind; all you have to do is to take a piece of hose and turn it in at the end

of the pipe and let it run, and go and do other work. Last year we put cement bottoms to the whole of the benches, but the plants suffered from cold feet, that is, they wilted, but with the changes we have made there is great improvement. To get good shaped tomatoes you have got to use sub-irrigation. Another thing is perfect pollinization of the fruit. We seldom get it rough. Here are samples of what we use in the house. The seed of this English breakfast tomato in my hand was brought out from the Island of Jersey a year ago. They run about seven to the pound. We grew them outside this summer and had good success. The others here are Industry, Bonnie Bess, the one you see on the market to-day, from the Island of Jersey and the Clipper. There is not much appreciable difference between Industry and the Clipper except in the way in which the plant carries its fruit. The Industry sets its fruit very close, not more than 8 inches apart,



The fruits of their labor.

while the Clipper runs to 12 inches. The Clipper also never sets a rough fruit, while the other will. This other is a new variety brought out by Eugene Davis, I believe originally from Wisconsin.

THE PRESIDENT.—They are ordinarily larger?

A. H. MACLENNAN.—Yes, they run to 14 ounces sometimes.

THE PRESIDENT.—The Grand Rapids is a poor pollenizer?

A. H. MACLENNAN.—The one I bought was, but our own stock is better. There was one very promising plant in the crop last year and I kept the seed from the best fruit: this year the plants are just what I desired. Bonnie Bess is the best commercial fruit.

PROF. TRACY.—Do you like one with a purple tinge?

A. H. MACLENNAN.—That depends upon the market. I prefer red.

J. W. RUSH.—Will that one suit the English taste?

A. H. MACLENNAN.—Perfectly.

J. LOCKIE WILSON.—Would you be willing if you get a sufficient amount of seed to distribute it in a reasonable proportion to the growers so that they could test it in different parts of the Province and make reports as they do at the Experimental Union?

A. H. MACLENNAN.—Since I was appointed to my present position at Guelph, any one who wished can have seed to test.

THE PRESIDENT.—I received three or four samples of seed from Mr. MacLennan last year. Among them was the "Industry," which gave better satisfaction than any tomato I ever handled in the greenhouse.

A. H. MACLENNAN.—I shall be pleased to supply seed to as many as possible, because the wider the distribution the more accurate will be our results.

J. LOCKIE WILSON.—The central executive will be in a very good position to find out from the growers if they would be willing to give a fair trial to some of the seed and if we communicated with you, you would, no doubt, be willing to send the seed to the Executive and we will forward it.

A. H. MACLENNAN.—I shall be pleased to forward the seed myself direct. If a man is in a hurry I will send him a plant. I generally carry from 300 to 400 plants. I have been picking tomatoes this year on my fall crop since the 27th of October, and my second crop for the spring is in 2 inch pots at the present time. I want to see if I can grow three crops in the year and make them all pay.

A MEMBER.—Do you know of any large commercial houses in the States where they use the sub-irrigation system?

A. H. MACLENNAN.—Yes, near Cleveland. If we can use it on a small scale we can use it on a big one. The main necessity is to get the tile absolutely level. You must have gates or all the water will go to the far end of the bed and you won't get any at the upper end. Put down your gates and keep forcing it back. The only trouble I have ever had is at the upper end of the bed where the water was put in. The plants in the first bed will generally show signs of wilting if it gets a little dry. It makes no difference whether the soil is poor or rich except that it will cost you more for water. You cannot get a more porous soil than cinders, which we use. We place cinders in the bottom of the two beds with 6 inches of soil on top: the tiles are half an inch underneath the surface of the soil and if water would go down anywhere it would there. We have heavy clay at Guelph, although it is not sticky, the only trouble is that it gets sodden if you have a cement bottom. In growing lettuce we find it is all right to use sub-irrigation in our soil. We have cinders there now, but next fall I am going to take them out and put in about one and a half or two feet of soil and then sub-irrigate. I find the cinders make too much trouble in the amount of watering we have to do. Next year we shall have to put our irrigation pipes much closer. This year they were three feet apart, but next year we will reduce this to two feet. I had intended to go in for cauliflower pretty strongly this fall and through the winter, but unfortunately the Botanical Department, under whose care the greenhouses are, requires them and we could not get the accommodation, except on a small scale. Last year I had good success. We require larger greenhouses and you should help us to get them. There are 115 students in the second year this year, some of the brightest vegetable growers I ever saw, and they are very willing. At the lectures we have 115 men where there is only room for 94. Where I would like to see expansion in the Guelph College is room for the boys in the first and second years. Many after the first and second years never come back. I want these men to leave the college with at least a first class idea how to handle any vegetable plant,

whatever it is, and if they can handle vegetables they can handle anything on the face of the earth. Then there is the indoor accommodation. I want to do more along the line of what you growers want done. This fall when I discovered the green houses of the Biological Department were to be taken away, I went to Prof. Crow, who is the head of my department, and together we drafted a letter to the President asking for more greenhouse room and he said he would take it up with the Minister. You should help us to secure this. There is another thing I forgot to mention in connection with our outside work; we have put commercial fertilizers on 4½ acres of garden, which we have divided into 9 plots, along with Professor Hartford of the Commercial Department. While we have not had definite results this year, we are going to carry that work on for five years and by that time we shall have ascertained the relative value of commercial fertilizers as closely as possible.

The President.—We should have a resolution put through this afternoon asking the Government to erect the necessary greenhouses. Many new problems arise every year, new diseases, and greenhouse forcing of vegetables is practically a new business in this country. We want those investigating these matters to have ample room and every facility for working out this problem.

Moved by J. D. Fraser, seconded by J. W. Rush.—"That after listening to the address of Mr. MacLennan, we, the Ontario Vegetable Growers, hereby endorse his request that the additional class-room accommodation and greater greenhouse space for vegetable experimental work be given as promptly as possible so that the good work being done at the Guelph Agricultural College in this branch may be continued and extended with the best possible results; and that we urge upon the Ontario Government to carry out the propositions of Professor MacLennan as soon as possible." Carried.

THE WORK AT JORDAN HARBOUR.

A. I. Logsdail, B.S.A., Hybridist, Jordan Harbour.

(Paper read by J. B. Lund.)

The following is a brief summary of the work that has been carried on at Jordan Harbour during the past year with regard to vegetable crops.

This Station was established in 1907, and in 1908, the first experimental work was commenced. This consisted in testing varieties of beets, cabbages, cauliflowers, peppers, tomatoes, potatoes, chards, egg-plants, lima beans; in all, over nine hundred varieties were grown.

In 1909, it was thought desirable to reduce in numbers the vegetables under experiment in order to allow a more particular study to be made of the individual characteristics and merits of each variety. The vegetables selected during this season were beets, watermelon, muskmelon, pumpkin, sweet corn, tomatoes, potatoes and carrots, and where previous work had been carried on with any particular line of vegetables, only those varieties which had shown any special merit were again selected for this work. It was found that more reliable results were obtained by this reduction in the number of crops grown, because more constant watch and study could be devoted to each crop. Nevertheless, the work was still much too general.

During the season of 1910, experimental investigation was carried on along somewhat similar lines with peas, beets, carrots, lettuce, tomatoes, sweet corn and potatoes.

Coming to the past season's work, we have further reduced our main crops for investigation to peas, beans, cabbages, tomatoes, sweet corn, celery, watermelons. By this means we have, for the first time, been able to introduce variations in cultural methods, a few of which, together with their results, I will briefly bring to your notice.

Of garden peas, we tested thirteen of the leading varieties. The seed was planted diagonally in rows an inch apart in a good fertile sandy loam, 150 feet of each variety being planted. Vines made excellent growth. A duplicate lot of these peas were planted and when the vines were about two inches above ground, they received a broadcast sowing of chemical fertilizer of the composition of 7.12.40 at the rate of 250 pounds to the acre. The results indicated that some varieties were much more responsive to the influence of chemical fertilizer than others. No appreciable increase of yield was shown by some, while in others the gain was as high as 30 per cent. Although we cannot presume to draw logical conclusions from a single year's growth, it is within reason to suppose that some varieties respond more readily to artificial feeding than others; therefore, we are endeavoring to classify our varieties in this matter. I may mention in passing that the pea which showed the most marked result was H. A. Dreer's strain of "Lightning."

We tested twelve well-known varieties of beans which were studied for their individual characteristics, besides which the whole sowing was duplicated to test out the merits of sowing in the matted row as against that of sowing hills. In the matted row, the seeds were sown two inches apart and the rows were spaced at two feet. In the hill system, six seeds were sown in clumps at intervals of two feet, thus the same number of seeds were employed in both cases. The average result was that the matted rows showed an advantage of yield of 18 per cent. over that of the hill system. It must be remembered that these results are the average of the whole experiment. There were some varieties that showed practically no difference, while others varied as much as 35 per cent. Fuller details of this and other experiments will appear in the Annual Report of the Experiment Station, issued under the supervision of the Department of Agriculture.

Fourteen varieties of cabbage were tested. We followed our system of duplicating for the purpose of studying cultural methods. In this case, the first batch was transplanted twice before being finally set out in the field. The second batch was sown with the drill in the field, allowing a few seeds to drop in each hill. These, after having reached the height of three inches, were thinned to one plant in a hill and the tap root cut with an improvised wheel knife. The result of this experiment showed that although the transplanted plants were a little earlier in maturing, the ultimate weight of the crop was slightly in favor of those not transplanted. The labor entailed in the second method was approximately 50 per cent. less than in the first.

During previous seasons we had tested a large number of varieties of tomatoes, growing a small plot of each. We had found that many of these varieties were practically synonymous and many of them were valueless for commercial purposes. We have, therefore, this year decided to test six of the best known varieties on a comparatively large scale. Our selections were Earliana, Success, Chalk's Early Jewel, Ponderosa, Dwarf Stone and Stone. The young plants were raised in the greenhouse on rich soil, the seed being sown in the latter part of March. The

plants were transplanted four times, and on the 22nd day of May, they were moved for the fifth time into the field and began to grow with apparently little check. The first to come in was Earliana, which was picked on the 31st of July, the others coming as follows: Chalk's Early Jewel, Ponderosa, Dwarf Stone, Stone and finally Success on the 18th of August. As regards yield, Success heads the list with 450 bushels per acre, Stone, 378 bus., Ponderosa, 338 bus., Chalk's Early Jewel, 300 bus., Dwarf Stone, 244 bus., Earliana, 160 bus. The percentages of unmarketable fruit, excluding rot and other fungous disease were as follows:

	Per cent.	
Ponderosa	14	unmarketable.
Success	23	"
Chalk's Early Jewel	25	"
Dwarf Stone	38	"
Stone	46	"
Earliana	49	"

Tomato rot was not generally prevalent in the field. Success showed injury to the extent of about 1 per cent., Chalk's Early Jewel, 2 per cent., Earliana, 6 per cent., Stone, 21 per cent. It is interesting to note that Ponderosa and Dwarf Stone were practically free from this disease, whereas Stone was severely attacked.

Notes were taken on the percentage of blooms set and the percentage of set blooms to mature fruit:

	Per cent.		Per cent.
Dwarf Stone set	63	and matured	37
Success set	55	"	26
Chalk's Early Jewel set	53	"	30
Ponderosa set	53	"	34
Stone set	32	"	27

The figures show us that these tomatoes set only about half their flowers and less than one-quarter produced fruit. At first sight, this information may seem to be of but little practical value, nevertheless, it is absolutely essential to know these numerous facts regarding a variety if thorough comparison is to be made with other varieties and improvement is to be brought about by breeding and cultivation. Ideal conditions of climate and culture would greatly increase the percentage of matured fruit. The large yields produced by many of our suburban vegetable growers may be almost wholly attributed to the fact that they give the plants more careful attention just at that season of growth when the fruits begin to develop. As an illustration, let us take the figures previously given with reference to the variety "Success." Suppose we had been able to mature all the blossoms that set, our crop would have averaged about 950 bushels per acre, but if we had been able to set all the blossoms that were formed and mature all these blossoms that had set, we should have reached a yield of about 1,800 bushels per acre, as the maximum possible production of this variety. Of course, this yield is absurd because it indicates perfection unhampered by climatic conditions, cultural methods and insect and fungous ravages; but it nevertheless serves to show that the losses due to poor cultivation are far too great in the majority of cases.

Past experience has shown us that the most valuable results in this work are those obtained by careful and accurate investigation. Such investigation

requires the constant attention of one or more men on a particular phase of the work. The number of men employed depends on the magnitude and thoroughness of the work undertaken. Our results of the past season have been so much in advance of anything heretofore obtained that we feel fully justified in still reducing the number of crops under investigation, but greatly increasing the thoroughness and scope of the investigation undertaken.

The crops that we desire first to devote our energies to are those most generally grown or representing the greatest amount of invested capital. Thorough investigation of these crops may cover a period of several years, but, at the same time, it will be our aim to collect general information regarding certain other crops so that when our main crop is changed for others, we will possess sufficient knowledge regarding them to enable us to carry on further investigation with little loss of time and labor.

Reaping the Harvest.

There is undoubtedly great need for experimental work with our canning and truck crops, and this field of investigation offers endless opportunities for a systematic classification of the now existing heterogenous mass of varieties and for the further improvement of these crops by breeding and cultural methods.

In conclusion, I would like to add that the practical and scientific phases of this work were carried on by students from Guelph, without whose assistance we would often be in a difficult position to carry on work as desired. Mr. J. B. Lund was very largely responsible for the work, and we hope to secure his services for the coming season at least. By this means, a progressive line of investigation may be undertaken.

MR. MACLENNAN.—I would like to see more visitors around the College. Since I took charge of my department at Guelph a year ago last May I don't suppose a dozen vegetable growers have been there.

A Member.—Mr. Lund says they adopted the hill system for cabbages, what benefit is there in cutting the root?

J. B. Lund.—It strengthens them, being practically the same as root pruning.

The President.—Do you pull the plant up and cut the root and put it in again? Does that encourage the growth of the plant?

J. B. Lund.—The roots are cut with a wheel knife that goes 2½ or 3 inches underneath the soil and does not disturb the plant.

The President.—Do you get increased vigor?

J. B. Lund.—Yes.

W. Decher, Macdonald College, Que.—Co-operation is essential for the success of any organization, and it is the same when two bodies have the same end in view: the Quebec and Ontario Vegetable Growers' Associations have the same purpose, that is, to further the interests of the industry. I have realized to-day how much we can benefit our Quebec Association by coming in contact with yours and have been very much impressed with your work, and the unselfish efforts to increase knowledge. Both Associations have things in common, no matter how far they are apart. For instance, last year your Association asked ours to join in securing legislation for standard weights for certain vegetables, such as potatoes, beets, etc. Our organization at once co-operated and is willing to do so at any time to obtain advantages such as these. Our Association is very young; we had the first annual meeting on September 8th, 1908, and it is chiefly limited at present to the environs of Montreal, where many of the most prominent growers are. Our annual meetings are quite successful. We are just learning how to use the key Mr. Baker spoke of this morning, to grasp problems and deal with them by exchanging experiences.

I thank you for the hearty welcome you have extended me, and I shall certainly go back full of enthusiasm to impart the ideas you have given me to-day.

NEW ONTARIO AS A PLACE TO GROW SEED POTATOES.

T. G. Raynor, Ottawa.

This convention has originated a large amount of enthusiasm, and we are all helped by the ideas and suggestions put forward here. I hope the day will soon some when every county will have its district representative, for I believe that is a bureau of information every county should have. It will help to solve a good many of the problems coming before us. They can pass the informtaion over to us on the sidelines and concessions who are trying to work out our destinies there.

A trip was arranged to inspect New Ontario and I took advantage of that, our department having been asked by the Association to look after potatoes that were sent there for testing for seed purposes. Already Mr. Wilson and our President have referred to New Ontario as a district for seed potatoes and I agree with them; every vegetable grower who co-operates in that work will be rewarded.

The question has been raised by your Association as to the possibility of New Ontario proving a good place for growing seed tubers. In order to test the matter arrangements were made through your secretary this spring to supply half a dozen farmers, three of whom lived in the vicinity of Charlton and the

other three in the neighborhood of New Liskeard, with seed tubers of the Early Ohio and Green Mountain varieties. When the potatoes arrived some disappointment was expressed in the varieties, and, in two cases in the quality of the seed; the farmers thought the potatoes very small to send out for seed. However, all six tried the seed and the results were varied.

Such an experiment should prove successful. Many farmers when changing their seed procure it from districts located north of them, and if possible, from a different soil. Local grown seed is usually better for the locality producing it than seed imported from southern districts. Northern grown seed tends to vigor and prolonged growth; southern grown seed tends to early maturity. Acting in accordance with this principle a number of potato growers in England send to Scotland for their seed.

Prof. Macoun, the Dominion Horticulturist, has found that seed tubers from the Maritime Provinces and Western Experimental Farms, tested at the Central Experimental Farm with their own seed, do much better even the first year. I have seen some of Prof. Macoun's experiments. Some friends of mine sent down to New Brunswick and got Delawares and other varieties and employed the same methods of planting and cultivating in use there, with the result that they obtained over $800 worth of potatoes. Their neighbors used the seed grown in this Province, but it did not do as well as in the ordinary season. That pointed to the fact that seed even from a distance solved the problem of profitable potato growing around Toronto at least.

It is a common practice among farmers to change their seed potatoes frequently. Their idea is that the seed runs out, and so it does, more especially when the small tubers are used. But when a variety does well and becomes acclimatized, frequent changes are unnecessary. In northern Sweden, for instance, some varieties of potatoes have been grown for over 100 years and are good yet. It may be observed, however, that some experiment stations have found that in working with the product of one tuber, the strain will begin to deteriorate in about twelve years and will not be profitable to grow for more than twenty years at the most. It is different with varieties where the tubers are not selected indiscriminately. For instance, I have met in Ontario at least six men who have grown one variety of potato for over 25 years, and to-day the tubers are as good, if not better, than at first. This was done by selecting only large uniform tubers for seed. Among the varieties so tested were Hebron, Empire State, White Elephant and Early Rose. At the experimental farm at Guelph, Prof. Zavitz has been testing several varieties, with ordinary selection, for 12 or 13 years, and he finds that they continue to improve in both yield and quality.

Since the organization of the Canadian Seed Growers' Association, a systematic effort has been made by potato growers in different parts of Canada to improve the crop by the hill system of selection, either from individual tubers or by selecting them collectively.

It may interest this Association to learn that in a recent competition in New York City a British Columbia grower won a $1,000 trophy for the best potato exhibit. He is a member of the Canadian Seed Growers' Association, and has been working along the lines of selection adopted by that Association for some time.

Experiment stations in Canada and the United States have given a good deal of attention to the potato, in an attempt to work out the best plans for growing, storing and marketing this important crop.

After testing the seed grown in New Ontario for a couple of years or so in the older parts of the province and finding it satisfactory, as I believe it will be found, it might pay the Association to buy some land there in a good locality and secure a practical man who would develop into a potato expert, or perhaps educate and send a local man up there to grow seed tubers. Incidentally it might be made a commercial venture, not only in growing seed tubers, but in producing them for the local and Toronto markets.

It was my privilege last August to visit and report on the six plots of potatoes in New Ontario to which reference has already been made. At the time of my visit they were in full bloom. The tubers were setting: in the case of the Early Ohio many were as large as, or larger than, hen's eggs. There was considerable variation in the stand of the crops. In some of the plots there were a number of blanks: two were so bad that replanting had to be done with other varieties, so that those plots would be useless so far as this Association was concerned. The blanks were supposed to be due to the use of cut seed, which rotted as a result of a heavy rain just after planting. The vines of those which survived or which were planted after the rain looked vigorous and were generally healthy. The Colorado beetle is not a serious pest there and one application of Paris green seems to be sufficient to destroy it. Blight seems unknown, but scab has made its appearance. Some of the growers had good crops while others did not do so well.

General Methods Practised in Growing Potatoes in New Ontario.—Most of you are aware that the soil of New Ontario is a friable clay with more or less humus in it. The amount of humus usually depends on how closely it has been burned to the clay. As it is either virgin soil or has been cropped only a few years at the most, no one uses fertilizers for potatoes, except, occasionally a small amount of stable manure. The texture of the soil shows both potash and phosphoric acid present in large quantities and in a readily available form. By common consent, fall plowed land is preferred to that turned over in the spring for potatoes. Some replow in the spring before planting. The seed is usually selected from the bin in the ordinary way and taken out of the cellar just before planting. For economy, many cut their seed, but a large number advocate the use of the whole tubers as they are less liable to rot, and produce stronger plants. The ground is fitted for planting from May 20th to June 10th by thorough cultivation and opening the furrows about three feet apart. The seed is planted in drills and cultivated one way.

The after cultural methods are much the same as are followed in Old Ontario. The harrow is used before the plants appear at the surface, and again when the vines are two or three inches high. The horse hoe follows this, deeply at first, then shallow at intervals of a week or ten days, until they come in bloom. In some cases hilling, which is a universal practice there, is done gradually: in others with the last cultivation. Potatoes are ready for digging the last week or ten days in September. They are usually put into the cellars direct.

There is no doubt but that some improvement can be made on their general methods whereby larger crops may be grown, although satisfactory crops are harvested under the present system. I believe that potato growing may be successfully exploited in New Ontario. I have some samples of these seed potatoes, and at the close of the meeting I will turn them over to you, and if you want to take some of them and try them you will be entirely welcome. In my hand I hold a sample of one of the varieties sent up there, Early Ohio. You will see it is a good specimen, smooth, and eyes are not too deep. While it may not be an average specimen, for,

no doubt, these were selected for their good appearance, still it shows what can be done. Near Falkenburg there is a grower who seems to secure most of the prizes for potatoes at Ottawa and Toronto. I have been on his place, and have observed his methods, and he has every opportunity for producing first-class potatoes. The potato I hold in my hand is the Newcastle; that is not the only name it goes by. It is a fashionable tuber, in good demand, and grows well in New Ontario. Here is another, a little flatter, also called Newcastle; it also goes under other names. One of the standard potatoes that grows well throughout Ontario and is a heavy yielder, the Empire State, is also in good demand because it cooks easily, not being very thick. This is Beauty of Hebron; a very popular sort some time ago; it is deep in the eye and irregular, but of good size. The Garden Rosette has other names. The chief objection to it is that it does not yield many to a hill. In that respect it is not as valuable as some of the other varieties. I asked the growers in New Ontario what variety they considered best, and was told Beauty of Hebron, Early Rose, Carman No. 1, and Green Mountain.

J. Lockie Wilson.—It has been suggested that our Association secure 100 to 160 acres of land in New Ontario, and experiment with potatoes. The Ontario Government, however, has 640 acres in the Monteith Farm, and it would be a good thing for us to let the Government do the experimenting along that line. I would suggest that this Association request the Department of Agriculture to utilize 50 or 100 acres of that farm for the planting and testing of the different varieties of potatoes, because that will be the first industry the pioneer settler will engage in, for he will have a splendid market at his door, in Sudbury, Cochrane, Cobalt, and Porcupine.

T. G. Raynor.—We visited that farm and found the potato prospects not very good, on account of Army worms; this is not likely to occur again. Mr. Wilson's suggestion is a good one: we should have a man in charge who understood potatoes, and who had the time to look after them properly.

The President.—The results at Monteith were not as satisfactory as we desired, and we thought that we would get better results by buying them from the farmers in the district, and I still think so: that is, if we want to get seed potatoes for our own use, get the farmers to grow them and then we would buy them. As far as experiment work goes, it seems to me that that is a part of the work of an Experimental Farm, but supplying seed potatoes is another matter. I have been up there three times, and there is a good market for all the potatoes they can grow. I was told in Cobalt that potatoes were worth $1.50 a bag, and at Charlton further on, $1.25. If we want the farmers to grow potatoes for us we must pay as good a price as they can get elsewhere. Early Ohio seems to be the potato we all want to get. The market up there is not a critical one, and almost any good potato will do. A farmer there is growing the Maggie Murphy, which will not sell on the Toronto market, but he can dispose of all he can grow at $1.50 a bag. If he can get that for Maggie Murphy potatoes, he would make more by growing Early Ohios for us. We left 20 bags of Ohios up there to be grown for us next year. If anyone wants Early Ohios I will give him the names of farmers up there that will grow them for him. We can never be able to supply the demand unless we induce more farmers to take up the work.

F. F. Reeves.—I am of the same opinion as Mr. Raynor. New Ontario is an ideal country for growing potatoes for our use, but we cannot expect to get them for the same figure as here, their prices being so much higher. I would like to see the Government set apart 50 or 100 acres. But we must have some one to look

after it. The first experiment up there was a failure, but I would not blame that on the man in charge. He is overcrowded with work, clearing up a new farm, and it is impossible for him to do that and give the time required for this work. It would be better to devote more of that 640 acres to potatoes instead of growing wheat and other produce they have no use for up there. They have no separator for threshing, and no barn to store it in when harvested. If that farm is going to be any benefit, it must be run in the interests of the farmers and vegetable growers. Buckwheat or wheat or barley is no use at present: the only market up there is for oats and potatoes. Your President and I were in Englehart and saw potato hills three feet high, and the tops were over six feet long; one potato weighed four pounds, a good meal for a family. The biggest and best potatoes I ever saw came out of a Dutchman's garden at Englehart. There is no doubt whatever that that is the best country for potatoes.

J. W. Rush.—Would it not be better for the Government to hand over 50 acres of the Monteith farm, and for the Vegetable Growers to put a good reliable

Tomato Blight.

man in charge, at a good fair wage, and send him seed potatoes and all the equipment that is necessary for handling 50 acres. He would want at least five men besides himself, and three horses. Do you think it is necessary to go so far north? Good potatoes are grown in Parry Sound and Muskoka.

The President.—The further north we go, in reason, the better. You all know what we have been paying near Toronto lately for seed garden peas,—$12, $13, and $14 a bushel. In New Ontario the pea weavil seems to be unknown, and enormous crops are grown there. A year ago, in New Liskeard, I spoke to the farmers there as to the possibilities of that country for seed peas. You know the seed we have been getting here lately has been mixed. While we had better experiment with potatoes at first, there is no doubt that there is a great future for peas in that section.

Prof. Macoun.—The question of how far north you have to go can only be answered by experimental work. There is no doubt that the cooler the district the better the seed potatoes will be.

J. W. Rush.—Would you suggest planting the early potatoes later in the season?

F. F. Reeves.—Yes.

J. Lockie Wilson.—I would suggest that Prof. Macoun ask the Dominion Government to establish a few hundred acres up in New Ontario for experimental work. Equipped as they are with money and a good staff at Ottawa, an experimental station established in the centre of that vast country would be of valuable assistance to us. While the Ontario Government are developing the Monteith Farm, the Dominion Government should also have a farm of their own.

Prof. Macoun.—I know the Government have under consideration the establishment of a farm in New Ontario, that is as far as I am able to state. I do not think it will be very long before there is a Dominion Experimental Station there.

The President.—This Association should memorialize the Dominion Government to this effect.

J. W. Rush.—Until this farm is established, where are we going to get our seed potatoes?

The President.—We have now got 20 bags up there, which is not a drop in the bucket. I can supply you with the names of reliable men who are willing to grow them. If any here will ship Early Ohio seed up there and take the resulting crop from them at the prices arranged for, there is plenty of time between now and next spring to make arrangements for what we want grown, and to get the seed necessary and have it shipped up there, and thus have, for the succeeding year, a large quantity of northern-grown seed potatoes.

T. G. Raynor.—If you are not willing to do this now you can rely on the farmers there growing the kinds you want, if you are willing to pay the price. The fertility of the soil is such that, alsike is, practically, a weed; hay, oats and potatoes are what they are making their money out of. I never saw peas podded heavier than at the Monteith farm.

Moved by F. F. Reeves, seconded by T. G. Raynor, "That this meeting wishes to impress on the Ontario Minister of Agriculture the wisdom of devoting a large acreage (say 50 acres) of the Demonstration Farm at Monteith, to the cultivation of potatoes, if it can be arranged that a good practical man be put in charge of the same. And we also suggest that the Dominion Government establish an experimental station in the middle of the sixteen million acre belt in Northern Ontario, for the growing of vegetables and grain, the products of such Dominion Experimental Farm to be distributed to the pioneer farmers and vegetable growers of the north land." Carried.

SEED BREEDING—ADAPTATION OF VARIETIES TO LOCAL CONDITIONS.

Dr. W. W. Tracey, Washington, D.C.

My colleague, Prof. Corbett, whose inability to attend I very much regret, was to have addressed you on the subject of "Good Seed," in which he takes a deep interest. In his absence I will touch on this matter because it is such an important one. There are varieties which are well suited to the growers, but are not offered for sale by the seedsmen, because there is not enough profit in them. Is it not a fact that the varieties you have are the varieties the seedsmen offer you, and the seeds-

man is careful not to offer you a kind that will not be profitable to him. That is the line of work which Prof. Corbett is very much interested in, and would have liked to talk to you about. But you must not condemn the seedsmen too much; they are in the business for all they can make out of it, and they will push the varieties which are the most profitable. I know by experience of two varieties of garden beans superior to anything in the country now, that have been pushed out of existence because the seedsmen could not grow them and sell them at a profit.

When in the beginning man was driven from the Garden of Eden where there grew to perfection all manner of herb bearing seed, out into the world which should henceforth bring forth to him thorns and thistles, and condemned to earn his bread by the sweat of his brow, the task set before him was not the increase of vegetable growth and vigor, but the direction and control of it, and from that day to this the basal purpose of all cultivation has been the shaping of the character, rather than the mere increase in quantity of plant growth, the forcing of the thorn and thistle to give place to the blade of grass or the ear of corn in such proportions as may best suit man's needs.

The jungle, the forest, the prairie, often, yes, generally, carry a greater burden of vegetation than the best cultivated field, but men, at enormous cost of labor, clear this away that the entire energy of sun, air and soil may be directed to the production of the particular form of plant which he may desire. A field in which plants of apples, currants, grapes, asters, cosmos, dahlias, beets, beans, carrot, cabbage, corn, cucumber, melons, peas, tomato, and turnips, each grow to the highest perfection, but in an indiscriminate mixture and proportion would be scarcely more satisfactory than the original forest or prairie.

In the case of plants like apple and grape in which each season's crop is the product of relatively few plants which occupy the ground from year to year the problem is comparatively simple, but where each season's crop comes from the development of thousands of plants, each the product of a single seed, the development of which is the result of the combinations in varying proportions of the influence of different ancestors back for an indefinite and varying number of generations, the problem becomes more complicated and is well worth the attention of all who are in any way interested in crop production, so that I do not need to apologize for my subject, even though I may fail in making it interesting or profitable.

A seed, be it ever so small, is simply a plant packed for transportation and carries within itself the same sort of potentiality and limitation of development and production as a grape vine or apple tree. Even a Burbank cannot gather grapes from thistles or potatoes from corn. It is true that the development of the plant may be more or less perfect, even that of blossom or fruit may vary under different growth conditions, just as a Jonathan Apple grown on the Pacific coast may be quite different from one grown on the Niagara peninsula, but a pomologist would not fail to recognize the sort in spite of such difference, and if we could interchange the location of the trees we would interchange the superficial character of their fruits. In common with all living organisms and even to a greater degree than is the case with many, the possibility and limitation of the growth of every plant is carried in the seed. This potentiality of development is made up of a balanced sum of variant tendencies inherited in different proportions from each of its ancestors back for many generations.

As the great purpose of all cultivation is uniformity of product, and since all possibility and limitations of development are wrapped up in the seed, its importance as a factor in determining the result of all our labor is evident. Further-

more, the importance as a factor upon which the profit of every culture is largely dependent of absolute uniformity, of all the plants of that particular lot being of exactly the same varietal character, or to express it in another way of the use of pure and true seed of the sort can hardly be overstated. We do not exaggerate in the least when we say that in the case of a majority of the fields of vegetables grown in this country, if all or even ninety-five per cent. of the plants were as nearly like the ideal varietal type of the sort used as are the best ten to twenty per cent. of them, the profit from the field would be greatly increased, often actually doubled. Uniformity of type lessens the cost of cultivation, since it permits the different operations to be done at the exact time when most beneficial to all of the plants, lessens the cost of harvesting for similar reasons, and increases the value of the product because of its uniformity. In any market uniformity in the character of the contents of a package is always one, often the most important factor in determining the relative price it will command, and the addition of different, even if they be distinctively superior specimens, will materially lessen its value. We already have varietal forms well adapted to all common cultural conditions and market requirements, and the most important problem is not so much the development of new and distinct variations as of growing purer and truer stocks of sorts we now have, by the use of which the planter can be reasonably sure that all the plants in his field will be of practically identical varietal character well suited to his particular conditions and needs.

In most cultures of vegetables there are to be found many plants which, though by no means phenomenally good, are very much better than the average, and many of them are practically identical in size of plant, date of maturity, color and form of fruit, and other varietal characteristics. Consider how much more the crop would be worth to you if all the plants in the culture were precisely like these instead of showing the diversity of character usually seen. Could you not well afford to pay double, triple, five times as much for seed, every grain of which would develop into just such a plant, as for most of the seed now obtainable.

Again and again I have asked gardeners and truckers, "What would you give for seed ninety-nine per cent. of which you were sure would develop into plants like that?" Yet the production of such seed is not an impossibility, for it has been done. We may not be able to fully accomplish it in all cases, but I am very certain that it is not only possible but entirely practicable to produce stocks which shall be much more uniformly of some certain varietal form and character than those now in common use, and that too without adding inordinately to the cost of production.

The first step in the securing of such a stock is to form a very clear and definite conception of the exact varietal form we desire. It is essential that this be written out and be frequently referred to in order to avoid the indefiniteness and change in the type selected, which I think is the cause of much of the variability now so common. I am well aware that it is a practical impossibility to write out a description which will enable the reader to recognize with certainty the exact type of plant the writer had in mind, but I also know by experience that the attempt to write such a description will always sharpen the writer's conception of the exact form he is after, and be of great assistance to him in holding to that exact model from year to year, as it is essential that he should do in order to establish a strain of seed which will be of the exact character desired.

The second step is to select a score or more plants each of which come as near the exact ideal of the sort as possible, avoiding the temptation to include even

superlative plants that differ in any way from the ideal of the variety. We should save the seed of each plant separately even where two or more of them are so near alike as to be indistinguishable.

The third step is to make growing tests of samples of each of these lots of seed —planting a liberal quantity of each, under uniform condition of soil and culture. As the plants develop they should be carefully studied and the lot in which each and every plant is the most like our ideal of the sort should be selected, resisting the temptation to take one which may contain superlative plants of the sort, but also some which are inferior, or one which though superior is of a different varietal type from that aimed at.

In order to guard against the possibility of a hidden variant in our selected plant and the many mishaps to which the seed grown is always liable, it is well to select one or more plants, as substitutes for our first selection. It is rarely worth while to save any seed of this trial planting, even that of our selected plants, at least not as a basis for stock seed.

The fourth step is to plant the reserved seed of the plant, which our trial has proved to be the best, and also when practicable, some of the substitute plants where they will not be liable to cross fertilization from other plants of the species. If our first selection was as good as our trial indicated and we have in it a plant of the exact type desired, which did not carry a hidden tendency to variation inherited from some earlier generation—the battle is won, for all we need to do is to multiply the descendants of this pure plant without their being contaminated through pollen from some plant of a different varietal character.

Human control of conditions are imperfect. Man must still earn his bread by the sweat of his brow, and it is quite possible that in spite of our failure to discover it in our trial, our foundation plant did carry a hidden variant which may crop out in some future generation so as to spoil the uniformity, in which case all we can do is to try one of the substitutes, or commence over again. Again, it is generally impossible to avoid more or less crossing in succeeding generations, so that sooner or later we are likely to lose any pure strain we may have obtained, but in the case of most vegetables, we can secure several crops before this occurs and in the meantime, we should have built up as good or a better strain to take its place.

Variation in all plants is so often the result of conditions of soil and climate and so largely a matter of degree that it is easy for one to find instances where members seem to substantiate any claim of variation that may be made. Nevertheless, I am tempted to give in detail one of the scores of instances I might give in support of what I have said. Some fifteen years ago there was developed a strain of a certain variety of watermelon in which an invisible but very desirable quality was corelated with one which was easily seen. A block of about one-half acre was planted with this stock, and about three-fourths of all of the fruits produced showed the peculiarity. Seed from the fruits of about forty of the plants in which this was best developed were saved separately and numbered in the order of the degrees to which they showed the variation, but it was so well developed in all of the selected melons that when the numbered ones were mixed, those who had made the selection and given the numbrs were quite unable to replace the fruits in the same order as before. The seed from each melon was saved separately and correspondingly numbered, and about one-fourth of each lot of seed was planted and labelled with the number given the fruit. When the plants came into fruit, though the general uniformity of the melons was noticeable, and most of the lots

showed more or less of the desired peculiarity, in only three of them, those numbered 3, 7, and 11, was it well developed in *every fruit.* All the other lots contained more or less melons in which it was absent or imperfectly developed—and strange to say, the lots from the fruits which had been marked, number one and number five on our previous year's trial, contained the greatest number of fruits in which the desired quality was lacking.

The next season the balance of the seed from the fruit which had been marked No. 11, was planted where there was little liability of the blossoms being crossed from other melons, and the entire seed crop saved for stock seed. The next year this stock was used to plant a 40-acre field, and when it was in full fruit, I and a bright and observant young man spent over two hours hunting in vain through it for a single fruit in which the desired peculiarity was not well developed. It is but fair to say, however, that when they came to gather and seed the fruit, twenty

Gathered in Autumn.

of them were rejected because they did not show the desired variation. Now for the sequel. Some nine years later I visited three large fields which were planted with seed which was only the fifth generation from that nearly perfect stock, and in not more than half of the fruits was the desired variation noticeable. The growers had thought that the seed from the original field was so perfect that it needed no attention, and it had gone the way of all neglected things. Some of you may say all this involves a great deal of thoughtful, careful work, *we* have no time to do it, and we had much better buy from the professional seed grower. It does require time and a great deal of most careful work, and you can buy seed cheaper than you can grow it, but very, very rarely can you get that, every grain of which is the product of plants of the varietal character which is best adapted for your climate, soil and market conditions. Again, experiment has proved that in some cases, at least, there is a certain acclimatization or adjustment of the plant to local conditions, and that this adjustment is carried in the seed so that local grown seed will often give distinctly better returns than equally carefully bred stock grown elsewhere. From what I have said it may seem as if I was antagonistic to seedsmen or at least to seedsmen's stock, but I assure you that this is not the case. I have had a pretty intimate acquaintance with seedsmen and

their methods, and I certainly think them quite as intelligent and honorable as any class of merchants, but they are not in the business from purely altruistic motives and will get their stock where that of the most saleable quality can be produced at the least cost, and that very often will not be in the location where the seed that will give the best results on your farm can be grown.

It would not be profitable or advantageous for one to attempt to grow all the various seeds he uses, but very often it will prove of great advantage for a grower, or better yet, for a group of growers to work together to grow what seed they need of one or two of those crops to which they have given in the past and expect in the future to give special attention.

A MEMBER.—What are the names of the two kinds of beans which are better than anything on the market?

DR. TRACY.—I do not know where they can be obtained. A grower in Central New York had a variety he tried to induce others to take up, but they found it cost too much to purchase the seed, and, in order to make any money they would have to sell it at a higher price than the other varieties they were growing, so they dropped it and it is practically out of cultivation. I have known in my experience of 30 years half a dozen of just such cases, varieties that were superior to what we had, but the seedsmen dropped them for lack of profits. We used to have a variety called the Crystal White wax; it was a very desirable sort but it was very hard to thresh. We tried to introduce that and get it into general cultivation, but nobody would grow it a second time, except one man, which surprised us and we asked him if he liked them. "Yes," he said, "I like those beans all right, whenever I want a little money I go out and thresh them." Another instance was the White wax; their defect being that they would easily stain and tarnish. A grower tried them but refused to grow them a second time, because they so easily tarnished.

J. W. RUSH.—We must not always blame the seedsmen if we buy seed for a certain type and they don't always turn out to be so. Watermelon and every other seed deteriorates every year. The very best selection of watermelon No. 1 proves less true the next year than any of the others. If it is so with watermelon it is so with every other seed. How are we going to get a true type of seed from the seedsmen?

DR. TRACEY.—The trouble is the vegetable growers have not a clear conception of what they want. A great many people don't know what they get, and seedsmen easily impose upon them. Determine what sort is best suited to your needs and seedsmen will supply what you want if you create a demand.

T. G. RAYNOR.—My work brings me in connection with men who are trying to improve their grain and seed crops by a system of selection, growing their seed in sufficient quantities to supply their neighbors. Mr. Hare, near Whitby, some 25 or 30 years ago, could not get a Toronto seedsman to buy a select variety of grain, but he sold it in Montreal, it proved popular there and he could not supply the demand. Some Wisconsin No. 7 corn was grown up near Walkerville some two years ago; one of the members of the Canadian Seed Growers' Association got some of the seed. If you want to see a return to true type you should see that corn standing up there like soldiers. It was all uniform. I believe the solution of this problem lies in the hands of the vegetable growers. Some of you could grow seed for the rest; our seedsmen would take it and handle it; you could do that through the Seed Growers' Association; we have several who could make a good success of doing it.

PAUL WORK.—One of our New York growers works out this problem in pretty good fashion. There is no crop in which good seeds counts for so much as celery, and each year he buys enough seed to make his whole planting from each of the five or six local seedsmen. That means buying quite a number of pounds of celery seed at a high figure. He plants two or three rows out of these packages, numbers the rows and the packages and lays those packages away and he judges the seed by those rows. That gives a true test. He knows what proportion of seeders he is likely to have. He picks out the one he likes best, and next year makes his planting from that package. The other five packages cost him a lot of money but he doesn't care about that: it has paid him in dollars and cents to buy that extra seed so that he can make his test.

ADDRESS.

C. C. JAMES, C.M.G., DEPUTY MINISTER OF AGRICULTURE.

I congratulate the Association on the evident signs of growth and vitality which are so manifest. I doubt if we have any organization connected with the Department of Agriculture that is showing so many signs of life as this one, and, judging by your programme and the reports of the meetings already held, you are not only a live association but you are alive to the needs and interests and requirements of the work in which you are engaged. Of course, if you do not show these signs yourselves, there is not much hope of continuance of life, but there are problems connected with your work which are springing up every year, and if you will simply take these up and help to solve them as they come along there will be no question as to the future growth and development of your organization. The vitality of your association is quite clearly manifest to anyone who goes down to the St. Lawrence Market and looks over the exhibits there. The flowers are all right in their place, very bright—in fact, they have become almost a matter of necessity in ordinary home life, but, when we come down to these things that are more necessary than the flowers, we realize that this Province is growing and developing when we can produce fruit, and honey, and vegetables such as we have displayed in that building.

I visited the growing town of Berlin lately and in the short time at my disposal I was shown a few of the factories. The first one we visited was the beet sugar factory. I had not seen it for several years, and was surprised to find what a number of changes had been made in that interval, and I doubt if in any line of work in this Province machinery has been brought into so much play as in this establishment. In one place we saw the farmers unloading their beets, and from that time till we came to the man that was stopping the spout when the barrel was full of sugar and adjusting the lid the hand of man was not applied in any way or particular from start to finish. What a wonderful difference there was between that perfect organization and what I had previously seen. As we went through factory after factory we found illustrated the necessity of introducing into the work everything that would utilize time and labor.

As it was a long time since I had been in an old fashioned cooper shop, we went to see barrels made. Instead of one man making the barrel from start to finish we found it took no less than four men and three machines to make one. The first man did nothing but fit in the staves, and from seven in the morning till

six o'clock at night that was his business. Those two things have been found absolutely necessary in modern manufacturing, for the purpose of accomplishing the end—economy and despatch. I have no doubt that a good deal of the interest that was formerly to be found in the work has been removed because of the dull monotony of the work. I am quite certain that it must have been more interesting for a man to make a whole barrel than simply a quarter of one, and we can carry these things to such an extent that we rob our work of its interest, but in this keen competition of town and city life those two things have been found necessary and essential in connection with our great manufacturing industries, namely the application of labor-saving devices and consequently the specializing and division of labor so that one man will do one thing and one only. We went to other establishments where we found the work even more specialized, where a person was occupied the whole day simply cutting out pieces of leather or rubber, little pieces to add on to what the next was cutting, and the thing was cut down so fine that one person merely put varnish on the rubbers. Is there any way in which the growth of this country is better illustrated than in the great amount of labor-saving machinery that has been installed? I am not speaking at this time about the farmer: you know more about that than I do, and you know of the importance and necessity of it more than the towns and cities do—the absolute necessity of providing by machinery in some way or other for that labor which is becoming so scarce in our rural parts, and as it becomes scarce becomes more expensive. Of course, if we all lived in the cities and towns the labor question would be solved off-hand, but those who are not up against that problem are not aware of the difficulties in the way. It is when we get into the rural constituencies and get face to face with the agricultural problem, live stock farming or vegetable growing, that you find there is more difficulty in procuring and applying labor than people in towns and cities are aware of. Can you not see that it is beginning to develop itself in this Province, and is there not something that you as vegetable growers ought to consider more carefully in connection with your work? Twenty or twenty-five years ago the average farm in this country was self-contained, produced most of the articles used upon the table and in some cases—going back a little further—produced some of the materials out of which the clothes were made. The family who lived upon the farm got out of that farm very nearly everything that was necessary for the ordinary life of the family—grain, fruit, dairy products, vegetables and so on, but these have gradually separated until now we have dairy farming, fruit and live stock as specialties, and you who are here to-night represent the specialization of that other side—the products of the garden. That is, you have taken out of the old-fashioned general purpose farm the little garden which at that time was utilized for the production of vegetables for the farmer's table, leaving a little surplus for the town or city market, put it by itself, enlarged it, intensified it and made a special calling of it. But there is a further specialization taking place and in a few parts of this Province you will see it. There is a little section in the western part of Ontario on the Detroit River where there is only one kind of crop grown, radishes, where a few industrious, intelligent, enterprising French-Canadian farmers have specialized in the growing of this vegetable. A little further inland they are beginning to specialize in the growing of celery, and further east is another section where the special crop is onions, and, you will generally find that where specialization has taken place there is at least a fair amount of prosperity. Those who take up one particular line make a success of it, because as a rule that crop is particularly adapted

to both the soil and climate. I venture to predict that in the next ten or fifteen years specialization in vegetables and garden produce will continue until we have in one section a large area given over to the growing of some one variety of vegetables, and other districts where specialization has taken place in regard to other sorts. Across the line you will find a large area devoted to the production of cauliflowers, chiefly, and other places where the growers are specializing in fruits. That indicates development and improvement and a higher state of cultivation, not only in the work that is being performed but also with those who are performing the work.

I do not come here to-night as a specialist in horticulture to give you any particular information in that line. You who have been spending your lives at that, who have been brought up in it and who are living in it, and who have got your knowledge largely out of your own experience, could stand up here and teach us, and recall some of the things which were known in earlier years. I do not presume to give you what you might call a practical talk, but I am very pleased to attend your convention. I have heard of your work, I know of it, and we have a great field to engage in.

I had the opportunity during my summer holidays to go to several countries in Northern Europe, and several things stand out prominently in connection with my trip about which I am going to speak to you. One Sunday afternoon I and two boys who were with me took a long walk down through the valley where we were spending a few days, and we saw a carriage standing in the distance. When we came up we found that the tourist was a man from Ohio with his wife; they had met with an accident, one of the ponies having cast a shoe. They went into a little farmhouse to have the shoe replaced, and the farmer who was a practical man adjusted the shoe and they drove off. We spoke to the man and asked if he could give us something to eat and drink. He shook his head, as he couldn't understand a word we said. We tried all the words we knew for tea and coffee. We finally went to the house and asked him if it was his, and by signs and motions we soon learned that was where he lived. We went in and spent some time trying to learn the Norwegian language and they the English. Sometimes we think in this country we have to live a very monotonous life and have not many of the blessings of life. They had not very much to eat in that house, but they were most hospitable, and, although we couldn't speak their language nor they ours, after a while we were supplied with the best the house afforded, set out on the little table. There was no cloth, or luxury of that kind. It was a large room, with a stove on one side, two beds on the other, and a table. It was a one-roomed house—dining-room, bedroom, kitchen and drawing-room all in one, and the meal that was set out consisted of a great bowl of soured milk, little slabs or sheets of rather thin bread baked perhaps once every three or four months, put away—sweet and nutty and nutritious, the most delicious bread I suppose one could possibly find to eat: good, rich, wholesome, well-flavored butter, and two kinds of cheese. After we started to eat he went over to the cupboard where there were three or four round cheeses, took one out, got a big knife and cut a slice off it, as you sometimes see a man take a slice off a loaf of bread. They gave us the best they had and that was their regular diet—bread, delicious butter, soured milk (not sour milk) and the choice of two kinds of cheese. That, perhaps, does not look very inviting to you, and yet they were strong and healthy and vigorous, clear-minded people, and economical in their methods of life; they have to be. We walked around the little farm, the little garden, that was in among the rocks on both sides of the door step, and saw little

patches of field here and there where they cut their supply of hay, and we came to the conclusion that it was a matter of necessity for them to live in this manner and that the luxuries of life were not very well known to them. A short distance away from the farmhouse we saw a long wire stretched from the hillside; over it were three or four. Soon we saw that each one of these wires ran up to a little clearing away on the mountainside, hundreds of feet up, or perhaps on the top of the mountain wherever there was a little patch as large as this room. These wires were for bringing down the crop to the barn. We spent a very interesting afternoon there, and we came away with the opinion that the people who live under these conditions are deserving of sympathy, and yet if you only knew them and how bright and cheerful they are you would not feel like extending it to them. You feel like picking them up (you could afford to leave their farm and buildings there) and bringing them out to the Province of Ontario and dropping them down on some real land; if that was done, the second generation of those people would be ruling this country.

A little while after that we went to Denmark, and the first person we met was a delegate who had been sent by the Government of Denmark two years ago to look over this country. We found much that was instructive, the farmers of Denmark are very interested in the Canadian market, and sent their commissioner out here. We met him at Copenhagen, and he asked us if we would like to see one of the farms. He went to the telephone and called up this farmer at his house. He came back, and I said, "That is quickly done." "Yes," he said, 'everybody here has a telephone." We are getting telephones into our homes. They have had them in Denmark and Norway and Sweden for years. We don't know anything about telephone improvements as yet. To use a telephone here you have to go into somebody's house or store. You do not have to do that there; they are on the streets and markets and wharves, and all you have to do is to put your penny in and telephone anywhere. We are apt to think we are very much cleverer than they are. It does one good to knock about amongst these people and get some of our wrong impressions cleared up. He arranged by telephone that we should go out by automobile the next morning. We started off, and glided over roads as smooth as anything we have in the city of Toronto. We drew up at the door of the farmhouse, and the proprietor came out to meet us and we saw at once there was an air of comfort—not of luxury, but comfort—about the place. There were no gew-gaws or over-ornamentation to be seen. It was a place where you would wish to stay for a week or two. The owner took the greatest pride in showing us his dairy cattle. When we came to the finest cow in the whole herd, I asked how much milk she gave. He put his hand in his pocket, pulled out a little book and gave me the whole record of the cow. I said, "Have you got the records of all the cows?" "Yes," he said, "they are all in this book." He was a business man, and it is no wonder that he succeeded. You would hardly expect the average farmer of this country to do that. A few do, and they are the most successful ones. This man kept his records in his pocketbook, and he could give you all particulars about every field and animal. Two little calves were born the night before, and he even had them entered in the book. Looking over one cow I said, "That is a pretty fine animal." "Yes," he said, "I will give you a photograph of her." I said, "I have a good photograph of that cow at home in my office." He was surprised, so I turned to the commissioner and said, "Haven't I?" and he said, "Yes, I sent it to you myself." We went over field after field and came back to the house at dinner time. I got as good a meal in that house as I ever sat down to in any city or house in the Province of

Ontario. After that we went over the garden. Coffee was served on the verandah and cigars and wine were brought out. This man was living there just as well as anybody in the city of Copenhagen, and enjoying life thoroughly. Here was the opposite from the other picture, that family up in the Norwegian mountains compelled to economize because they were living on the ragged edge of nothing, and here was this man on the rich lands of Denmark surrounded by beautiful conditions —a lake on one side, a big State forest on the other, and a main highway of the country past his door. Standing in front of his porch was not an automobile, but a motor cycle. He says that he couldn't afford an automobile or to drive horses to town. He always took into consideration what he could not afford to do and what he could, and you could see that in all his farming operations. The result was that he is classed among the successful farmers of his country, he is getting as much enjoyment out of life as he can, and a happier home in the country I have never seen.

Celery well bunched. Firsts and Seconds.

We came back through Holland. If you ever go to Northern Europe be sure to take the train past the little village of Haarlem. The land there was at one time waste sand at the bottom of the ocean: they pumped it out, and, of course, that is the explanation of the story of the little hero of Haarlem. You will be captivated as you go through that country, the little fields are about half the size of this room with hedges around: you would think the people were playing at farming. Fields of flowers and vegetables made the most gorgeous display I have ever seen. You will find here, perhaps, the most intensive farming in the world, and when you consider that the crops are raised on what was once sterile sand, you will come to the conclusion that by the application of unremitting labor the desolate places of any country can be made to bloom as at Haarlem. Not only do we have very little of such land in this Province of Ontario, but there is a variety of soil such as perhaps no other part of the continent possesses. Having these opportunities, what are we going to do with them? You who are members of the Ontario

Vegetable Growers' Association I know are doing your part, and, if we could only get all the other members of the community working as intelligently, thoroughly and faithfully as you are, this country would go ahead and prosper at an unprecedented rate. I wish you continued success in your work and your conventions.

THE PRESIDENT.—It is always a pleasure to hear Mr. James. I remember an address of his three years ago. "Enthusiasm" was his text, and it made a great impression on me. Most of the success of Mr. James in his public work in Ontario is due to his wonderful enthusiasm.

ADDRESS.

HON. J. S. DUFF, MINISTER OF AGRICULTURE, TORONTO.

It is a pleasure to hear Mr. James because he always has something interesting to say and says it well. These people we heard about make the best of their conditions, or else they would not be comfortable, whether they are poor or whether they are rich.

Mr. James talked about specialization. That is a splendid idea. While we are specializing however, we must be careful to select the line that suits us. I was privileged lately to visit parts of rural England: I spent a week there and rode over the beautiful roads they have. My wife and I visited Canterbury Cathedral, with its many historical reminiscences. We went by way of Chatham and came back another way and had splendid roads on that round trip of 117 miles. One of the ladies with me said, that when she got back to Ontario she would tell people that they ought to have better roads. "Why haven't we got roads like this in Ontario?" she said. I said, "My good lady, remember that Julius Caesar walked over these roads." They have been building roads in England and Northern Europe for a thousand years, and while there is room for a good deal of complaint about our roads in Ontario, yet, when we look back and see what has been done in the last hundred years in this Province it seems to me we have a good deal to be proud of.

Those of us who take an interest in our country roads in the Province have seen a tremendous improvement in the last ten or fifteen years. It looks now as though it will not be a matter of many years before we will have more trunk roads for the people, and it will be possible to get into an automobile at Montreal and travel straight through to the Pacific Coast. The building of such a road has been lately in the public mind. You will notice that we Canadians now-a-days do not think long about things before we carry them out. Public opinion, as a rule, is always on the line of advancement. One thing not to be forgotten about the farms in the Old Country is their loveliness. There is a steel engraving hanging in our dining-room at home entitled "The Emigrant's Farewell," the woman leaning over the rail of the vessel as it is going out from the dock, with her Paisley shawl over her head and her old-fashioned handkerchief. It is no wonder that these people grieve at leaving their beautiful homes in the old land. I visited Covent Garden Market, a wonderful place. The extent of it is simply marvellous, and it would not be hard to get lost there. The wagons coming in with vegetables have them piled up in tiers: they were carrying the maximum loads on those wagons, and you vegetable growers can take a lesson from that. In that great market you could see scores of women sitting around doing nothing but shelling peas. The time will come when we will do our marketing on the same lines. This country is going ahead too: in

Toronto we are to have tubes and we will have a population of a million in a few years. The increased population in this country will widen your markets. We hear a great deal of the scarcity of labor on the farms, and we who live on farms know that is so. But there seems to be a scarcity of labor everywhere. We shall have to put up with it so long as our great development continues. Last night I was at the Horticultural Exhibition and was delighted with the splendid display. I am sure none of you present could see those vegetables without feeling a thrill of pride. It showed that while we are developing commercially we are also doing this in other ways, and we must keep up with the procession if we are to cater to the commercial development we see around us.

MARKETING PROBLEMS.

PAUL WORK, ITHACA, N.Y.

I first heard of the Ontario Vegetable Growers' Association when I was attending college in Pennsylvania. I wanted to know something about mucklands, and was told that your Association had published some very valuable reports, and so I wrote and got what I wanted. They were of great assistance to me, and, therefore, when Mr. Delworth invited me to address your Convention I was pleased to accept, and I have had a most enjoyable time. Less than a year ago we formed an Association in New York State something similar to this; we are making good progress and intend to have a good meeting about February 19th, and it would do us good to see some of you over there. Ithaca is not very far from here.

The labors of the vegetable producer culminate in the marketing of his crop. Every activity is governed by its effect on the sale of his produce. In seeking a location, his first consideration is the market which he expects to serve, and he buys accordingly. He selects the crops that he thinks will sell to the greatest advantage, and he plans his planting and his cultivation with this point constantly in mind. We have intensive market gardeners and extensive truckers. We have muckland growers and upland growers. We have cold frame men and greenhouse men. Each of these classes has its own peculiar problems, but every one has the marketing problem. The first step in its solution has been taken when the work of the ensuing season is well planned. The early winter months should find the grower with a rough diagram of his farm before him, while he decides the crops to be planted and the fields that are to be used for them. These are purely local and individual questions, but one or two principles hold in general. It is not well to plant too many crops. Most market gardeners try to grow everything. They desire to supply their customers with a full line of vegetables. In doing this, they cannot give any one of their crops the study and care that are essential to the highest success with them. Some of their crops mean a dead loss, but they carry them for their trade, depending on others to make up the difference. Might it not be well for each to select the crops which he likes best and with which he has the highest success? Then let him become a specialist in these. It will simplify his farm work, and his marketing. His methods are bound to improve rapidly. He can study out the details that make for earliness, yield, and quality. He can then command the market for those crops, possessing both quantity and quality. Dealers know that when a load is wanted quickly for an unexpected order, he can supply it. This idea will not appeal to many local market gardeners, but it is worth considering most carefully. I am well acquainted with a grower who had

the greatest success with two crops grown for both early and late markets. He was a specialist, and his workers became specialists in cultivating and handling these crops. It paid well.

On the other hand, I need not dwell upon the necessity of growing more than one crop to guard against failures, and to provide for proper rotation. Growers in one of our New York muckland areas are making just this mistake, giving their whole attention to lettuce. They will be caught sooner or later.

Economy of Effort.—Plant to have produce when others have none. This may be early in the season, or it may be late, but early crops are especially profitable. Leave no stone unturned to mature a marketable quantity when your neighbor has not any. Early plants that are vigorous and stocky, ready to grow unchecked, are most important. Such special devices as the ridging of early ground are well worth while. Norfolk growers, as well as many others, practise this plan, and make every row a warm southern slope.

Earliness secured by any of these methods gives the producer a hold on the market. He who comes first and can supply the grocer with fresh produce in place of that which has been shipped for hundreds or thousands of miles, establishes his trade and can hold it throughout the season.

Moreover, the early crop brings the best prices. This can perhaps be best shown by the accompanying table, which indicates the difference in returns due to earliness occasioned by a difference in strains of seed. Strain A had matured 77 per cent. of its crop at the eleventh week, while strain B had matured but 35 per cent. at that time. The later yields for strain A were correspondingly low, while for B they were high. These differences in earliness are the actual results of a careful test made with Early Jersey Wakefield cabbage seed, secured from many different sources by the Pennsylvania State College. The prices assumed are those which prevailed on the New York market for cabbage from the eastern shore of Virginia during 1910. It is noted that, assuming a ten ton crop, the difference for a single acre amounted to $65.70.

Difference in Returns, Due to Difference in Strains of Seed.

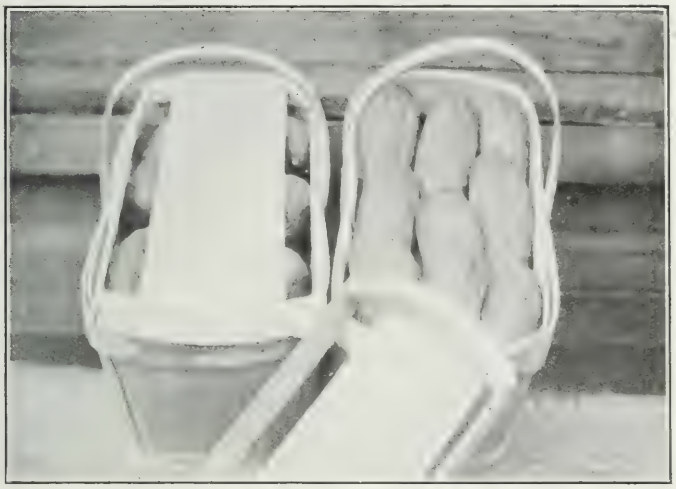
Strain A.	11th week.	12th week.	13th week.	Later.	Total.
Percentage sold each week ..	77%	10%	8%	5%	.....
Weight sold each week	15,400 lbs.	2,000 lbs.	1,600 lbs.	1,000 lbs.	10 tons
Price per 100 lbs.....	$1.37	$1.00	$0.57	$0.57	.....
Return	$210.98	$20.00	$9.12	$5.70	$245.80
Strain B :—					
Percentage sold each week ..	35%	25%	16%	14%	.....
Weight sold each week.....	7,000 lbs.	5,000 lbs.	3,200 lbs.	2,800 lbs.	10 tons
Percentage per 100 lbs.	$1.37	$1.00	$0.57	$0.57	.....
Return	$95.90	$50.00	$18.24	$15.96	$180.10
				Difference..	$65.70

Having planned the season's work, the next task is to see to the package supply. Perhaps we cannot do better than to outline the points that should be sought in the ideal package.

1st. It should be strong and should protect the contents well. The square bushel box that is used in Boston serves this purpose splendidly.

2nd. It should present an attractive appearance. A moment on Washington Street, New York, is sufficient to emphasize this point. Where there are hundreds of dealers and millions of packages, the ones that attract attention sell first. In the case of boxes used repeatedly on local markets, paint does wonders. Rochester gardeners are much to be commended for their careful regard for this point.

3rd. The package should display the produce to advantage. This point counts with the consumer. The more strongly your product appeals to the housewife, the larger the quantity the dealer will demand of you, and the better the price he will pay. Handle-packages are worth while. They seem to say to the buyer, "Take me home with you."



Climax baskets are popular in the Middle West States.

4th. Other things being equal, use the package that is standard on your own market; but if that package is not good, do not be afraid to try another. People soon recognize merit, even if it is in new array. Thenceforth, your package is your mark.

5th. The package should be easily handled. The barrel to which our Long Island and New Jersey friends cling so firmly invites abuse, while the six-basket carrier is almost uniformly held right side up. The Climax splint basket is good in this respect.

6th. The first cost should be low. The present tendency is strongly in favor of the gift package. It is then always clean, fresh, and bright, and the trouble of securing its return is eliminated.

7th. Exact measure when level filled. A slack package turneth away the buyer. Better use the smaller one and fill it well.

8th. Empties should be capable of compact storage. It pays to buy in carloads before the season opens, thus taking advantage of slack time at the factories, and of your own slack time for hauling and nailing up.

Finally, do not, if you can avoid it, put your high grade produce in a package that is used for low grade stuff, unless it is very well marked. A good many growers who pack the best head lettuce in boxes use the bushel hamper for culls. Other growers put their best in the same package, and neither mark the lid. The result is readily seen.

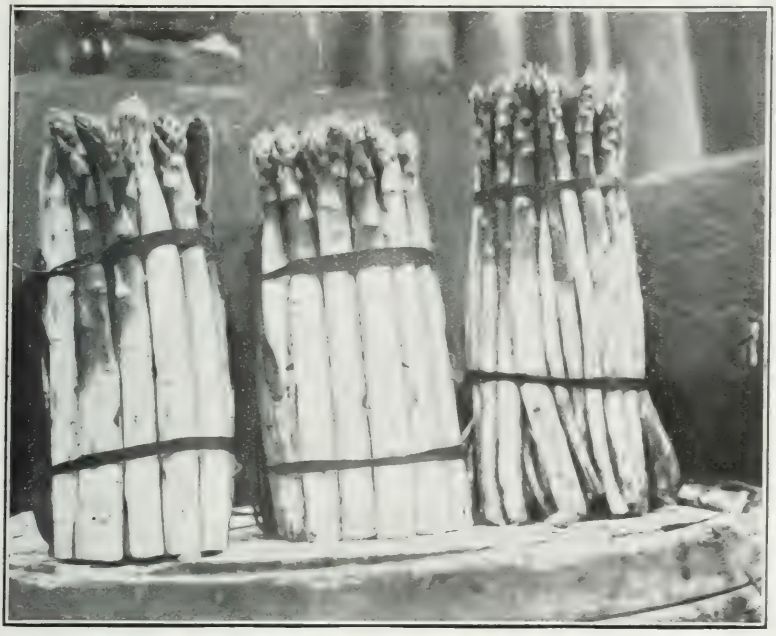
Having chosen the proper receptacle for this produce, and having stored a good supply safely under cover, the grower may now await the maturity of his crops. It is needless to dwell upon the importance of the best cultural methods in their effort upon the marketing of a given vegetable. Produce quickly grown is crisp, mild and tender, and the buyer wants more. The actual work of marketing begins when the first of the crop is ready to be gathered from the field. It is impossible to lay down rules as to when a given vegetable should be harvested. This depends upon marketing methods, market demands, and weather conditions: hence, the best of judgment is required. Two common mistakes are to be avoided. First, the shipper must not pick too soon. In our section, southern tomatoes and melons are avoided on account of poor quality, and home grown stock easily commands the market in face of a serious over-supply of shipped produce. Shippers must devise means to shorten the journey from field to table. For instance, might not a Tennessee tomato grower gather fruits just showing color, grade them to perfection, pre-cool them, and ship directly to distributors in our larger northern cities? As a matter of fact, the fruits are picked before the ripening process has begun, are shipped under ice to New York or Pittsburg, are reshipped, and are then often held by the grocer for a few days before they are ready for sale. Result—a tomato handsomely bound in rich red morocco leather.

The second error is the use of improper picking vessels. The old-fashioned baskets woven from oak withes are strong and durable, but with the ordinary sizes the weight on the bottom layer is too great, and the rough surface means bruises which are invisible at the time, but which make trouble later. The smooth-finished, half bushel fruit packing basket is good. It is, however, better to use a cheap vessel, so that a large quantity may be picked and hauled without dumping. Thus the fruits are handled but twice between field and market wagon or car.

On most farms the work of hauling from field to packing house is most uneconomically done. The first necessity is proper equipment. The wagon should be low, with a wide, flat bed, and narrow sides. High lifting and small loads cost money. By all means, build the wagon for short turns. The nearer you can get to the crop, the better. Farm roads should be kept in thoroughly good condition by the use of wide tires and the split-log drag. More trips are made over the main farm road than over the public road. I know one grower who keeps his farm road well rounded, who has removed the hump that held the load limit low and whose drivers are careful not to make ruts. This road saves dollars every day that produce is marketed.

Every year sees the work of grading cutting a larger figure in the work of marketing than it did before. Grading was once unknown. To-day the producer of fruits and vegetables is following close upon the trail of the manufacturer who long ago realized the necessity of uniformity. The citrus people took the lead in this. The western apple shippers were next, with the vegetable shippers close upon their heels. The progressive market gardeners are now awake to the fact that two gnarled cucumbers cut the price of the whole bushel. Hundreds are still asleep.

Every man and every community must make its own plan of grading. What suits one market does not suit another. Many are discouraged in setting the standard high, because the lower grades are becoming increasingly difficult to sell.



Asparagus well graded and bunched. Firsts and Seconds.

Good Asparagus badly bunched. Note uneven length, rough butts and worthless string.

We had to discard a considerable proportion of the second grade tomatoes at Cornell during the past season, but it paid. At one time ordinary run-of-the-field fruit was bringing 25 cents a basket. Our primes sold at 40 cents, and seconds at 20 to 25 cents. Seconds are not wanted in large quantity on most markets. Many hold that the moral of this is, "Don't grade. If the consumer doesn't want seconds, make him take them with the best." But the true moral is, "Don't grow seconds." Of course, there will be some inferior fruit, but if by selecting a well bred strain of a good variety, and by giving the best of culture, we can reduce the seconds to very low proportions, we will not mind leaving a few culls in the field.

One of the most common mistakes in grading is in reducing the standards when the price drops. When markets are glutted, the question ceases to be one of securing a high price, but it becomes a question of moving the crop or letting it rot. People continue to use the product, and that in large quantities. They are willing to pay a price which will cover marketing cost and a good share of production, but the question is, which grower can sell, and which can not? Naturally, the one with the best sells. The following clipping which is typical of a large number that appeared in our trade papers during the season just closing, furnished good evidence on this point.

"Lettuce from State points has been in free receipt, and much has been sold for less than charges. Fancy heavy-headed stock is worth 50 to 75 cents per basket, but average grades are neglected at 10 to 25 cents per package."

The time of oversupply is when grading counts. The grower has established his trade on a basis of quality, and by maintaining that, he is able to hold on while the other fellow drops out. Moreover, Mr. Grader still holds the trade when the market picks up.

It is by no means easy to maintain a standard of grading. One naturally desires a maximum of primes and a minimum of seconds, and he even unconsciously tends downward. With hired help, the problem is much more difficult. The first essential is to form a mental image of the standard for each grade, working it out carefully and making it neither too high nor too low. Fix these standards as far as possible by the use of sizing boards and the like. Constant and rigid inspection is then necessary. If a large quantity is handled, each worker should have a number to be placed in each basket. Thus responsibility is fixed. Here is one of the greatest advantages of machine-grading. A machine is free from the failings of human nature.

Having made the goods right by good grading, we must make them appear so by good packing. It takes no longer to lay a specimen in place than to lay it out of place. Experience makes experts at this, and a well finished pack costs hardly anything more than one which shows a rough and uneven surface. You are doubtless interested in the cost of some of these things. For three summers I worked on a vegetable farm where a packing system had been established, making use of the Diamond market basket. Picking in the field cost a cent a basket, piece work. Grading and packing likewise cost a cent. Perhaps a half cent should be added for extra handling, making the cost from the field to the market-wagon two and one-half cents a basket. During the worst glut that this market ever knew, an increase of one and one-half cents a basket was realized over the price received by neighbors, whose handling cost was as heavy or heavier. Moreover, my employer was moving 500 baskets a day when others could hardly move any.

We have spoken thus far of the various ways in which a grower may use his skill and forethought to enhance the value of his product. The question at once

arises, "Suppose I follow out these methods? Suppose I increase the value of my produce? Shall I be able to realize on that increase?" Nothing aids more in this than attractive and forceful labelling. I can best illustrate by example. Mr. Green, Grocer, phones to his commission house for a hamper of lettuce. It comes and it proves to be good. The packer has had good lettuce, and has been careful, though he makes but one grade of his crop. Mr. Grocer wants more. Again he 'phones and gets a hamper. This one looks just like the other, bearing on the top merely the address of the commission man and a number for identification. But this time he receives the produce of another grower who makes three grades. This basket contains the third. Next day Mr. Grocer goes down town, calls on his dealer, and sees the first grade from this grower, packed in a box, and well labelled. He sees his error, and thenceforward orders the distinctive mark at an advance in price. This happens repeatedly with other grocers and growers. The poor lettuce has spoiled the trade in unmarked stuff, and all such passes for culls, or nearly so. The man with the label reaps the profit. What, then, is the use in doing the thing right if we do not bring the credit and the future sales, and the future profit to the proper place?

California asparagus growers are successful in this. Their beautiful bunches are enclosed in attractive lithographed wrappers, and they held the market in our town last spring as well as in many others, though the price was high. Another plan has brought splendid returns to a New Jersey grower. He knows how to judge a watermelon, and takes advantage of that knowledge. Every melon bears a paster, printed in red, about an inch and a half by two and a half inches in size, bearing a guarantee of the quality. Just another example. A western New York lettuce grower declares on his label that it is his aim to pack nothing but perfect produce under that mark, and he asks the purchaser to report any imperfection to him. If such a label will not inspire confidence, nothing else will, and the people that buy vegetables are very different from those who buy other things. As I waited for a train at a small station last summer, I saw a neatly lettered crate of celery. The grower's name was there. I did not know the grower, but I sent for a package of his product for use in an exhibition of marketing methods. I was not disappointed. His name gave me the confidence of which I have just spoken, because not many care to use their names in connection with low quality. This mark, I have since learned, is proving a great success in connection with a high class order trade.

Thus we see that growers are learning the advantage of special marks and labels, but the process is slow. The shippers are in the lead. Many a box of high quality produce bears the name of the dealer, not the grower. The reputation is going to the wrong men.

Preparation for market is the greatest single item in the cost of producing many, if not most, crops. This work, at the same time, offers the greatest opportunity for economy. Time, that factor in crop production which is each year becoming costlier and harder to secure, may be gained or lost at hundreds of turns. Go to almost any factory where, for instance, a food product is prepared. You will find each worker in his place when the whistle blows, and you will find, for ten hours, the work going on with a rapidity and skill that is marvelous. You will note further that every appliance is arranged for expeditious movement. We of the vegetable farm may well pattern after the modern factory: we must respond to the modern call for efficiency.

Here, again, we see the advantages of dealing in large quantities of a single thing. He who bunches carrots for an hour, then gathers beans for two hours,

grades and packs melons for a while, and ends the forenoon by loading a wagon for market, becomes expert at none of these tasks, and his labor is costly. If the acreage must be small, we must have recourse to the packing-house system, where the produce of a neighborhood can be handled under satisfactory and economical methods.

In many localities acreages are limited by the fact that labor is not to be had. This condition is all too prevalent, and cannot be remedied as long as the fields are small and few. But the man whose market or vineyard operations are on a large scale, can secure foreign labor under leadership of a boss of their own race, who can understand both the owner and the laborer. Those who are near cities or good sized towns, are often very successful in the use of gangs of boys under a competent foreman. The youngsters are nimble-fingered, and at such tasks as picking and grading are of almost as much value as men. The Hall Warner Company of Ohio follows this plan, using perhaps four or five crews of a dozen boys each.

It is impossible to over-emphasize the importance of method in every detail of the work of marketing. A worker may seem to be busy, and using every energy, whereas he is practising an awkward method. If a packer insists on using four motions for an act that should be accomplished in three, that packer is unprofitable. In the interest of efficient work, the tables, packages, and other equipment should be conveniently arranged. Thus, in packing tomatoes in three grades, this plan has been found good: The ungraded fruits are put in basket A, directly in front of the packer. The vessel for primes is placed at his left on a gentle slope, while the seconds are received by basket C, just behind A. Unmarketable fruit is thrown in some such vessel as a candy pail D on the floor. It was found that if this arrangement was changed, the resultant motions were awkward and consumed time. For such work as this, the tables should be of the proper height, and the workers should be seated. They will do more and better work, and will be contented.

To haul to a packing house seems costly, but it should be done more frequently than it is. It means economy and good results in more ways than one. The house should be so located that a full load can be readily drawn away from it. It is seldom the case that a full load can be made up in the field.

The arrangement of the packing house is most important, whether it be large or small. It ought usually to be more than a mere shed. It cannot be too carefully planned. Produce should be received at one side or end, and should, as the work progresses, move directly across the house to the loading platform on the opposite side. In this way, there is no confusion, and it is not necessary to carry packages of one sort over or around those of another sort. Sanitary conditions should be carefully looked after. The floor should be of cement, or other waterproof material, and should be kept scrupulously clean. The lighting should be of the best.

Modern machinery should be used at every possible turn. The onion topper has come to stay. One Western New York grower is working on a machine to harvest spinach without letting it fall on the ground, thus keeping it thoroughly clean, as is required by the canners. This same grower has devised a portable grading table for lettuce, which means a great saving to him. The orange growers have worked out handling devices to a remarkable degree. An interior view of one of the California packing houses shows a most complex array of machinery that has been invented for the purpose. We must follow suit on our large farms, and in our association packing houses. Moving belts are much used in the West

for grading. A central belt carries the ungraded fruit, while others running parallel to it receive the different grades as they are sorted out by skilled hands. The peach grader has proved invaluable in handling the crop. It cannot bruise the fruit, and it does its work well. With its aid a force of twelve, costing twenty-two dollars a day, is able to handle 1,500 baskets of fruit, making three or four grades. A New York association expects to use some such device next year in packing cucumbers.

The vegetable grower who serves a local trade has few better advertisements than a neat and attractive wagon well painted and clean, a good horse well groomed, harness blackened and buckles bright, and by all means, a neat-appearing driver. These seem to be non-essential extras, but every one means economy.

A road like this may mean the saving of $1.00 a trip on a five-mile haul.

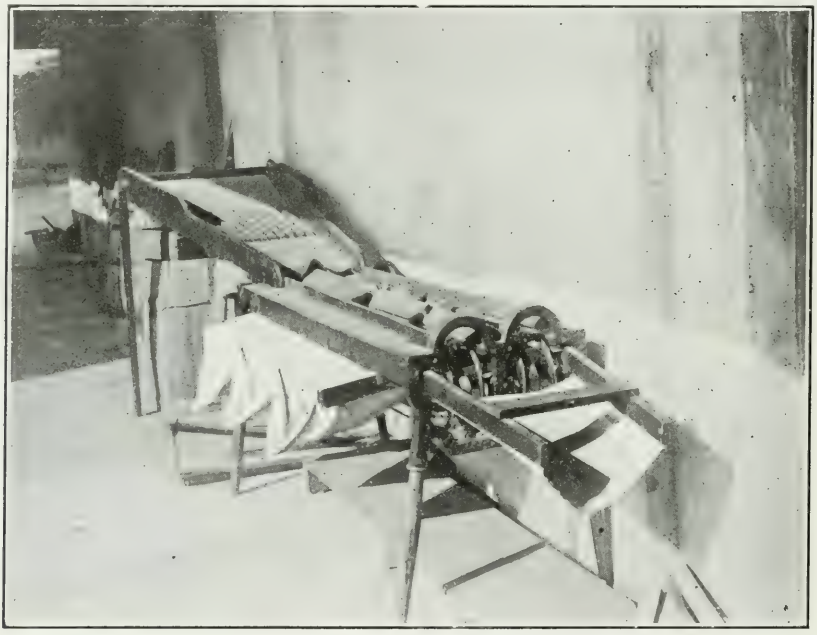
Paint preserves the wagon, a good horse is cheap, careful attention lengthens the life of the harness, and a slouchy, dirtily dressed driver is seldom a good salesman.

Few realize the cost of bad roads in time and wear, and tear, else every important gardening section would be as well off as that to the southeast of Buffalo, which boasts two brick roads to the heart of the city, one of them twelve miles long. When such roads as this are common, we shall be able to handle such loads as are carried by our Long Island friends, and will then find the auto truck thoroughly practical and an economical vehicle.

The two keys which unlock the door to good railroad service are, it seems to me, quantity and persistence. South Lima, New York, by organized and persistent effort secured a siding which involved the handling of many train loads of earth. Ionia, New York, growers, working separately, could never have gained the facilities which their heavy shipments demand, and which they now enjoy through

the efforts of their association. A couple of months ago, I alighted from the car at the greenhouse plant of Mr. J. H. Rice, at Ashtabula, Ohio. A car was about half loaded with cucumbers. I had been there but a few moments when I heard one of the men at the 'phone asking the yardmaster to send on an engine. In ten minutes the load was on its way to Pittsburg. Thus, again, quantity commands.

In calling your attention to the advantages of advertising for the vegetable grower, I would merely raise this question in your mind. Here is a method of trade-getting that has been so successful as to justify the expenditure of millions in almost every other line of industry. Is it likely that it cannot be adapted to the needs of the vegetable producer? We have on record several splendid examples of the success of such schemes on both local and distant markets. The real difficulty in the way of advertising for the vegetable grower is, that so soon as he makes his product known, he is almost sure to be swamped with orders, and will find it necessary to stop the advertisements.



Peach Grading Machine. Handles the fruit accurately, rapidly, and without damage.

Thus far we have considered distinct ideas and phases of marketing. I wish now to bring to your attention two exceptionally good examples of systems of marketing, worked out in accordance with the principles I have suggested. Both have proved successful in the first degree.

Ionia, New York, has for a number of years been an important centre in the production of cucumbers for market. Until two years ago each grower did his own marketing, either by shipment on commission or through local buyers. It is needless to detail the difficulties and dissatisfaction of this system. Many of us are still laboring under it. All of us have done so at some time or other. Two years ago the growers of this section were brought together under the leadership of Mr. C. R. White, in the Ionia Growers' Association. He has worked out a system of marketing that has proved nearly ideal.

Baskets of the ordinary type are bought in large lots at unusually reasonable figures. These are issued to growers, and a record is kept by means of punch marks on a duplex ticket. The baskets are used for picking, and the grower brings his load directly to the packing house of the Association in Ionia. His load is tallied on another set of duplex tickets, the punch indicating the number of baskets, run-of-the-field, which he has brought. They are then ready to be graded and packed. The equipment for this work consists of four tables, each accommodating eight workers. They consist of frames bearing two sheets of canvas. The upper sheet is fastened only at one edge to permit of the easy removal of dirt. Two tables stand in each of two rooms, which are managed as separate units.

The cucumbers of a single grower are brought and emptied upon the tables, and the work of wiping and grading begins. Each worker wears a fleece mitt with which the fruits are quickly rubbed, and dropped into the proper one of six baskets, of which there is a set for every two graders. The grades are designated as No. 1, Fancy, Dills, Extras, and No. 2's, while the sixth grade is discarded. No. 1's and Fancys are perfect, differing only in size. Extras are over size, and are not held to so rigid a standard of perfection. No. 2's or Choice are of the same size as No. 1's and Fancys, but are slightly off in form, or perhaps are slightly blemished. Dills are perfect, but smaller than Fancys. The discard receives all misshapen and otherwise blemished specimens.

As the baskets are filled, they are removed to piles, according to grade, and are covered. After all of a given grower's lot has been placed upon the tables, the grading is completed, parts of baskets are filled, and a tally is taken of the number of each grade. This is also made by means of a slip and punch. The full baskets are then removed to the shipping platform, and another lot begun. Parts of baskets over a half are tallied as one, while minor fractions are discarded.

Careful record is kept of each car shipped. These records are filed in the office of the Association, where they are typewritten on three duplicate sheets. The white one is kept at the office. The other two, pink and yellow in color, are forwarded to the consignee, with the request that he fill out both and return the pink, securing the signature of the freight agent. This sheet, with the white one, is filed for permanent record, and is invaluable in dealing with claims.

The bookkeeping in the office is necessarily rather complex. Yet the system of duplex tickets has done much to simplify it, and to insure accuracy. Baskets drawn are charged against the grower, while those returned are credited. Baskets shipped are finally charged at actual cost. The pooling is based on the third ticket mentioned, and is carried out each week. A special book is used for this purpose. It has at the left a space for the initial and number of the car, and this is followed by a space for the number of baskets of each grade, the net price received for this grade, and the total. In this way, the actual net return is calculated, and is entered on the ledger account of each grower who shipped that week. Checks are then made out and handed to the grower. The actual cost of the packing, usually from two to two and one-half cents per basket, is deducted, together with a small commission. The salaries of the manager, bookkeeper, and foreman are not included in the cost of packing, and these, with other expenses, are paid from the commission. Each year's surplus of commission over expenses has been used in improvements. The Association is organized as a stock company with $10 shares. As to results, this Association has shipped this season a large number of cars. Good prices have been received much of the time, and fair prices all the time, including one or two periods of glut, when other shippers were moving none.

I have now to present a plan of marketing which is decidedly original, and

which is being worked out by a western New York grower. This producer was a city business man, who has given an increasing amount of his time to his gardens, until a year ago, when he left the city entirely. His home being in East Aurora, he chose the name "Sun Rise Gardens," and with the help of a home-made manure greenhouse, he undertook the task of furnishing vegetables of quality to the housewife before that quality has departed from them. His leading crop is Golden Bantam sweet corn. It is gathered in the afternoon, and is brought to the packing house. If the day is hot, it is placed on tables, over which play the sprays of several sprinklers. After it is thoroughly cooled, it is closely graded, and the best is packed in dozens in neat cardboard cartons, bearing the following legend:

Absolutely Reliable
Away from Dust and Dirt
No Handling
Fresh from the Gardens

Sun Rise Gardens
Golden Bantam Sweet Corn.

Special Trade Marks pay.

It also shows the date of shipping and the signature of the proprietor. The packages are placed in crates, and shipped direct to grocers who handle the product regularly. The price received throughout the season is twenty cents per dozen. The seconds are consigned to commission merchants to be sold in the ordinary way, while thirds are fed to the hogs.

During the past season, Mr. Tyler marketed the produce of thirty acres of Golden Bantam corn. At the time of my visit to his place about the first of September, he had already marketed 12,000 dozen. In carrying out this work, Mr. Tyler has had some interesting experiences. When he was about to make his first shipment, he called a grocer by 'phone, and told him he meant to forward some corn which was to be sold at twenty-five cents per dozen. The ruling price at the time was nearer fifteen cents, and the grocer hooted at the idea. Mr. Tyler forwarded the corn in spite of objection, instructing the grocer not to sell any for

less than twenty-five cents, and to keep none over until the second day. At the same time, he assumed the risk, agreeing that the dealer would owe him nothing for corn unsold. Only a few boxes were forwarded. The next day, the order came for fifteen, and the next day for an increased quantity. Thus was the trade first established. Ever since, the hardest struggle has been with the retail dealers, to convince them of the merit of the idea, and to induce them to give it a fair show. During the present season, a retailer said to Mr. Tyler, "The corn is fine, but the price is too high. You sell to me at fifteen cents, and I will move double the quantity." Mr. Tyler agreed to try it for two weeks. Sales actually fell off, and back went the price to twenty cents.

We might have taken up many other questions, such as those that arise in connection with weights and measures, and those pertaining to the planning and management of local markets. But we must pass these by for the present. Leaving all these questions behind, we must conclude that he who plans, grades, and packs well, and who conducts his operations on such a scale as to permit of practicing economy in details, and commanding both labor and markets, will surely win. If he must labor on a small scale and cannot work with his neighbors to secure those advantages he will certainly be crowded out by those who can. His retreat is even now beginning.

J. Lockie Wilson.—We have listened to some splendid addresses to-day, and Mr. Work's is certainly one full of interest to everyone here.

The President.—A good deal has been said about eliminating the middleman. Very few growers sell direct to the consumer; personally I don't receive $5 a year from the consumer direct. It is pretty generally understood that the large rewards of this business go to the man who makes a success of his crops, and who produces something a little better than some one else. My own success I attribute to the fact that I devote myself to those lines that are best suited to my business. It is necessary to have a middleman handling our products, although he receives too large a share of the profits.

Paul Work.—The same condition is manifest on the other side.

A Member.—Growers should tell the middlemen that the price is so much and stick to it.

Our produce is worth twice as much to-day as it was two years ago, which is due to the work of this Association.

Moved by F. F. Reeves, seconded by J. W. Smith, "That this Association tender a hearty vote of thanks to all the speakers who have addressed the Convention." Carried.

J. W. Smith.—This is my first visit, and I am in hearty sympathy with the work that is being done by the vegetable growers. To be successful we must organize. I am going to impress upon my branch the necessity for being thorough in their work.

A hearty vote of thanks was passed to the Corporation of the City of Toronto for the use of the hall. A grant of $10 was made to the Hospital for Sick Children.

The Convention closed with the singing of the National Anthem.

CELERY.

F. F. Reeves, Humber Bay.

Any fertile, well drained land will grow celery, but muck soil or peat bog are generally used for this purpose, if they are available. The principal reason

for this is that celery requires a large amount of moisture, and this is generally near the surface in land of this description. It must be well drained, however, as celery will not grow if there is any tendency to sourness in the land. The crop is more easily produced on this than any other soil, but the keeping qualities are not so good, nor will the flavor equal that of celery grown on a good sandy loam. If you have only clay soil, it can be made to grow fairly good celery by the application of plenty of barnyard manure. One thing to be guarded against in growing celery on clay is the danger of the clay washing into the hearts while they are small.

There is no fertilizer so satisfactory as barnyard manure, well rotted, if possible. Gardeners, however, as a general rule plow in stable manure green. This should be done, whenever possible, in the fall. Barnyard manure not only furnishes plant food for growing the crop, but greatly improves the condition of the soil, by adding the necessary humus. If the manure is well rotted it may be plowed under in the spring or used as a top dressing shortly before planting. We use between thirty and forty team loads to the acre. Most soils are improved by the application of ground quicklime, from 800 to 1,000 lbs. to the acre, as a top dressing, but care must be taken to distribute it as evenly as possible. When lime is applied to clay soils it has a tendency to lighten them, while sandy soils are made more retentive of moisture by the addition of it. Some growers also apply salt at the rate of from 500 to 800 pounds to the acre. Celery will take up a limited amount of salt, and the flavor is improved by it. In using commercial fertilizers for celery a quick-acting kind is necessary. The mixture suitable for growing celery should contain about 6 per cent. nitrogen, 5 per cent. available phosphoric acid, and 10 per cent. of potash. A part of this can be drilled into the land by a fertilizer attachment fastened to a grain drill, and the rest scattered in between the rows, working it into the ground with a cultivator. When the plants have become well established the growth may be hastened by frequent light applications of nitrate of soda to the surface of the soil. This must be worked well into it, otherwise it will leach away. From 200 to 500 lbs. per acre may be used. For early celery, for cutting in August, the seed should be sown about the middle of February. It should be sown on a greenhouse bench, in flats or in a hotbed; if sown in a greenhouse, it should be on the shady side of it. The seed bed should be composed of plenty of leaf mould or well rotted manure well sifted, with a top dressing of half an inch of sand. The seed should be sown in rows 3 inches apart. The seed will take about three weeks to germinate; the covering of soil, if any, should be very light. The soil should have a liberal application of water before the seed is sown. After sowing, the bed or box should be covered with a paper or cloth, to keep the top from drying out; this should be kept damp, but removed when seeds begin to sprout. The soil should be watered frequently, but never become water-logged. Care must be taken after the plants are up not to water too heavily, or the seedlings will be liable to damp off.

For a later crop the seed may be sown outdoors, either in a bed or in a row, where it is to grow. When this is done the land should be well pulverized with horse tools and raked by hand. The sowing should be done with a seed drill very shallow, as the seed will become sufficiently covered by rains if the watering-pot is not used. It is a good plan when sowing outdoors to sow some other crop (say radish or lettuce) a few inches from the celery row in order to provide a partial shade to the young plants during the warm days of early summer. This should

be sown just as soon as the land is warm and fit to get on. There are no plants that require more hand labor than celery; they should be handled and transplanted at least two or three times before setting out in the field where the crop is to grow. For an early crop the plants should be transplanted as soon as they are large enough to handle. The seedlings should be ready for this about five or six weeks after sowing. One good result of transplanting is that the straight root or top root is broken, causing a large mass of fibrous roots to be formed. The work of planting in the open is greatly simplified by transplanting, which also produces strong, thrifty, bunchy plants that grow very rapidly. At the first transplanting the plants should be set about one inch each way; the second time two or three inches. The ideal celery plant for setting in the open should be about three inches high, with a mass of fibrous roots, which will spread over a space equal to the top of the plant. In lifting celery plants from the bench or boxes a knife or trowel should be used, cutting between the rows of plants in both directions, the soil is thus divided into cubes, making it very convenient to handle, and the plant is not checked. The soil should be well watered before doing this, sufficient time should then be given for the tops to dry. Many gardeners puddle the roots before planting, by dipping in a slime of clay and water. This excludes the air and supplies moisture. A good plan is to add a little cow manure to this mixture, this gives the plants a little fertilizer to induce growth under their new situation. The soil should be in good condition at time of planting, otherwise it is almost impossible to have satisfactory results. It should be well disced and harrowed, then a drag or border should be put over it so as to level it up. The land is then marked off in rows 3 feet apart for single rows, 3 feet 6 inches if double rows are used. A good way to do this is with a seed drill, which leaves the land in almost perfect shape for planting. The plants should be set from six to eight inches apart in the row. For double rows plant alternately.

The single rows will produce the best celery and require the least labor, and celery grown in the single row generally keeps the best. For the double rows the soil must be very rich. The double row has its advantages where boards are used for bleaching, as the same material will serve for the double row as for the single. For the single row about 28,000 plants are required for an acre, and about 40,000 for the double row. Plant when possible when the soil is moist. If you have to water run out a narrow furrow and pour the water along it. After planting cover the wet earth with dry soil to prevent a crust being formed. Have the crown of your plant about even with the surface of the soil; if too shallow, the plants will suffer from winds and lack of moisture; if too deep, the soil will be washed into the heart. Cultivate with horse scuffler frequently, but not *too* close to the plants. If the soil is stirred frequently to a depth of about 2 inches it will form a dust mulch; water will thus be drawn up from below and the roots will receive the required moisture.

A mulch of half-rotted or green stable manure is good on all soils, but is specially desirable on sandy or clay loam soils, this is best put on when the plants are 5 or 6 inches high. It should be 3 or 4 inches thick, but do not let it get into the heart of the celery. It will shade the ground and keep it from drying out and aid the plants by its fertilizing qualities.

Bleaching can be done any time after the plant has made sufficient growth, but warm, sultry weather generally results in some loss by decay and running to seed. If the nights are cool the results will be much better. Bleaching is usually done by means of boards set on edge along the rows and held in place by wires or stakes driven into the ground. It usually requires from ten days to three weeks

according to the weather: a week longer will be required if the blanching is done with earth. The boards should be one inch by twelve, and not more than 8 or 10 ft. long; if they are longer they will curl at the ends and necessitate frequent turning. Throw a little dust along the lower edge of the boards to close any opening owing to the irregular surface of the soil. Do not let the celery remain in the boards too long after being marketable, as it loses in weight and flavor, and is more liable to blight. Never handle celery when the top is wet, it induces rust. Celery blight, or leaf spot, is caused by a fungus and is very destructive.

The first indication is in the form of grayish spots on the leaf, which turn brown in a day or two. If conditions are suitable to the development of the disease (that is, if the weather is sultry, the nights warm and the atmosphere filled with moisture) the disease quickly spreads to all parts of the plant, causing it to have the appearance of being scalded. If the plants receive any check they are more liable to the disease. You cannot stop the disease once it shows itself.

It can only be combated to a large extent by spraying with Bordeaux mixture every ten days or two weeks during the growing season.

Pithy stems or plants shooting to seed are generally caused by the plants not having been properly grown or by unfavorable weather. To prevent this, use more water and manure.

REPORT OF TORONTO BRANCH.

We have fallen down somewhat in the number of members of our Association. This can be accounted for to a large extent by the fact that a large number of members, who have for years been active in the Association, have been crowded out, owing to the rapid growth of the city, and have either retired from active business or moved further away. Our monthly exhibition of vegetables has been very successful, the competition being very keen.

We tried this year to collect our yearly dues by sending each member in arrears a coin card, along with stamped addressed envelope for reply: this entailed a large expense, and the result was far from satisfactory.

About 175 cards were sent out, and we had only 41 returned, or less than 25 per cent.

In February the Branch, by resolution, requested all the members who could get away to take part in a deputation to Ottawa to protest against the proposed reciprocity agreement: it was also resolved to pay the railway expenses of four members of this deputation. We were turned down very gracefully by the Premier, but our time came on September 21st, when reciprocity was buried good and deep.

Our annual "At Home" in February was a great success, and returned a balance to the good of $25. The annual excursion on August 2nd to Niagara Falls was, as usual, very successful, financially and otherwise, leaving a balance on hand after paying all expenses (including $36 bonus on the sale of tickets) of $146.15.

I cannot close without thanking the officers and members for their hearty co-operation in forwarding the work of the Association.

To keep it up to the standard entails a great sacrifice of time, generally when we are very busy. During the many years I have been your secretary, I have always received loyal support in my work from all our members, for which I thank you.

FRANK F. REEVES,
Secretary-Treasurer.

REPORT OF LONDON BRANCH.

The London Branch of the O.V.G.A., in 1911 offered a prize to the member making the best report on growing tomatoes with the idea of ascertaining which was the most profitable tomato to grow for canning factory purposes. The seed was to be sown April 1st, and not less than six varieties to be tested; the following is the report. The winner of the prize was G. W. Bycroft, Byron.

Tomato seed was sown April 1st, in trays or flats in the greenhouse and transplanted into trays and then retransplanted into the soil of greenhouse and set out in the field on June the 5th, eleven plants of each variety all given the same treatment. The following named varieties and color:

	1. Red.	2. Red.	3. Pink.	4. Pink.	5. Red.	6. Pink.	7. Red.	8. Pink.	9. Red.	10
First Picking.	Earliana.	Chalk's Jewel.	Livingstone Beauty.	McInnes' Pink.	Red Canner.	Plentiful.	New Stone.	Byron Pink.	Bonny Best.	Champion.
For Week—	lbs. ozs.	lbs. ozs.	lbs. ozs.	lbs. ozs.	lbs. ozs.	lbs. ozs.	lbs. ozs.	lbs. ozs.	lbs. ozs.	lb. oz.
Aug. 5th.....	3 7	1 5	0 0	0 5	4 2	2 8	0 0	3 2	2 6	0 0
" 9th.....	3 14	2 11	0 14	3 14	4 1	4 12	0 17	4 6	3 10	4 3
Total.....	7 5	4 0	0 14	4 3	8 3	7 4	1 1	7 8	6 0	4 3
Aug. 14th.....	9 13	6 10	1 6	7 0	12 6	5 8	3 17	7 0	5 12	5 2
" 18th.....	6 3	0 10	1 11	3 10	3 3	1 8	1 5	2 14	2 4	0 10
Total.....	23 05	11 4	3 15	14 13	23 12	14 4	6 7	17 6	14 0	9 15
Aug. 21st.....	3 16	0 14	0 6	2 11	7 10	1 8	0 7	2 6	2 10	0 0
" 25th.....	5 7	1 9	0 14	3 14	7 8	4 14	1 8	6 14	3 1	0 15
Total.....	33 1	13 11	5 3	21 6	38 14	20 10	8 6	26 10	19 11	10 14
Sept. 28th	1 13	2 2	0 0	3 6	5 5	0 15	0 0	3 9	4 12	0 10
Oct. 1st.....	11 8	4 9	7 10	7 11	10 2	5 0	0 11	8 10	6 9	0 13
Total.....	46 6	20 6	12 13	32 7	54 5	26 9	9 1	38 13	31 0	12 5
Oct. 4th	8 9	5 15	9 8	10 4	13 13	6 11	1 8	13 5	9 5	2 13
" 8th	15 3	22 0	15 9	23 9	32 1	15 2	6 1	24 12	19 8	6 8
Total.....	70 2	48 5	37 14	66 4	100 3	48 6	16 10	76 14	59 13	21 10
Oct. 12th	18 12	27 6	35 2	37 7	33 8	40 5	14 1	33 0	22 8	18 6
" 15th	5 13	12 8	14 0	15 11	9 7	14 12	5 6	7 3	5 7	6 13
Total.....	94 11	88 3	87 0	119 6	143 2	103 7	35 17	117 1	87 12	46 13
Oct. 18th	6 7	17 7	14 6	9 4	12 12	18 9	11 1	9 15	7 2	8 7
" 22nd	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
" 25th	4 8	13 13	13 15	24 6	8 10	17 12	9 15	6 9	4 3	6 1
Total, season 1911	105 10	119 7	115 5	153 0	164 8	139 12	57 1	133 9	99 1	61 5

For season 1910. Test figured to 11 plants only 9 plants stood.

	Earliana.		Chalk's Jewel.		Canada Pride.		McInnes' Pink.		Red Canner.		Wonderful.		Bonnie Best.		Plentiful.	
	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.
Total.....	95	9	81	13	77	7	58	7	76	5	55	8	76	4	88	0

For season 1909. Test figured to 11 plants.

	Earliana		Chalk's Jewel.		Plentiful.		Canada Pride.		Royal Red.	
	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.
Total.....	167	2	89	1	94	3	89	6	77	11

Remarks on 1911 Test Relative to Prices.

On Aug. 25th. tomatoes were selling at 50c. per basket in London Market, the value of plants in the order named would be at that date.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$0.99	$0.41	$0.15	$0.64	$1.16	$0.62	$0.25	$0.80	$0.59	$0.33

Value of Plants or Tomatoes at end of season.

$2.07	$2.00	$1.80	$2.62	$3.05	$2.40	$0.98	$2.40	$1.78	$1.09

Much praise is due to a London Grower. Mr. A. McInnes as the originator of three of the varieties named in the list. Red Canner. McInnes Pink and Plentiful, and to Mr. Sanderson, Byron, Originator of Byron Pink.

REPORT OF ST. THOMAS BRANCH.

As the result of co-operative effort the following reduced prices on supplies were secured for the members of the St. Thomas Branch through their purchasing agent, Mr. Geo. Philp, Jr. Cartage and storage extra. Articles listed F.O.B. shipping point freight extra.

Double Band Berry Boxes, 1 qt.	$ 2.80 per 100,	F.O.B.	St. Thomas.
24 Box Berry Crates in flat	10½c each	"	"
4-qt. Climax Fruit Baskets with covers	31.00 per 1000	"	"
" " " no covers	24.00 "	"	"
6-qt. " " with covers	35.50 "	"	"
" " " no cover	27.50 "	"	"
11-qt. " " with covers	39.50 "	"	"
" " " no covers	31.50 "	"	"
Apple Boxes, 50 lbs. capacity, in flat	14c each	"	London
Lime Sulphur Solution in car lots, 40 gal. bbl.	6.50 per bbl.	"	Hamilton
Ground Sulphur in 112 lb. bags	1.50 " 100 lbs.	"	"
Arsenate of Lead, 100 lb. kegs	8.75 " keg	"	"

Blue Stone in 450 lb. casks ..... 5.00 " 100 lbs. " London
White Arsenic, in 100 lb. kegs ..... 7.00 " 100 lbs. " "
Berger's Paris Green, in 100 lb. cartons, lowest wholesale price. (Price not yet made.)
Binder Twine, best quality manilla " " " " " "
Salt, in car lots, F.O.B. Kincardine.

Table Salt, 30-10 lb. sacks	$2.40	per bbl.
Fine Barrel Salt	.80	" "
Fine Dairy Salt	1.40	" "
Fine and Coarse, clean, in 200 lb. sacks	.50	" sack.
Land Salt, in 200 lb. sacks	.45	" "
Land Salt, in bulk	3.00	" ton.

Land Plaster F.O.B. Caledonia.

In jute bags	4.20	" "
In cotton bags	5.20	" "
In bulk (car loads only)	2.95	" "

Wire Fencing, lowest wholesale price, F.O.B. St. Thomas, ranging from 17c per rod for fence 40 inches high, 5 wires, stays 16½ in. apart, No. 9 wire, to 31c per rod for fence 50 inches high, 10 wires, stays 16½ in. apart, No. 9 wire.
Poultry fencing 50 inches high,, 15 wires, stays 24 per rod, top and bottom, wires No. 9, filling No. 12 .....35c. per rod.
Straight Fence Wire, No. 9, $2.20 per 100; Coiled, $2.25 per 100 F.O.B. St. Thomas.
Fruit Trees and Nursery Stock 30% off catalogue prices.
Seed Grains, Vegetable and Field Seeds at 25 per cent. discount off catalogue prices, ... F. O. B. Toronto

	No. 1 Gov't Standard	No. 2 Gov't Standard		
Red Clover	$11.15 per bush.	$10.70 per bush.	"	"
Alsike Clover	10.15 "	9.35 "	"	"
Mammoth	12.50 "	11.60 "	"	"
Alfalfa	8 90 "	8.45 "	"	"
Timothy	7.30 "	7.00 "	"	"

Fertilizer Chemicals—

Nitrate of Soda	$52.60	per ton,	F. O. B.	Buffalo
Sulphate of Potash	50.85	"	"	"
Muriate of Potash	43.60	"	"	"
Acid Phosphate	13.60	"	"	"
Bone Meal	27.60	"	"	"

Mixed Fertilizer for—

Wheat, Corn, Oats and Rye	24.50	"	"
Beans and Peas	22.50	"	"
Celery, Potatoes and Onions	28.50	"	"
Garden Truck and Small Vegetables	30.50	"	"
Orchard	24.00	"	"
Extra Phosphate and Potash for Orchard	20.50	"	"

Cement—Prices on application.
Hand and Power Spray Pumps, High Pressure Hose, Spray Rods, Nozzles and Hydrometers—10 per cent. discount off catalogue prices. The Spramotor Co., London, and the Niagara Brand Spray Co., Burlington, Ont..

FOURTH ANNUAL REPORT

OF THE

ONTARIO

Corn Growers' Association

1911

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty
1912

Printed by
WILLIAM BRIGGS,
29-37 Richmond Street West,
TORONTO.

To His Honour Sir John Morison Gibson, Knight Commander of the Most Distinguished Order of St. Michael and St. George, a Colonel in the Militia of Canada, etc., etc., etc.,

Lieutenant-Governor of the Province of Ontario.

May it Please your Honour:

I have the pleasure to present herewith for the consideration of your Honour the Report of the Corn Growers' Association for 1911.

Respectfully submitted,

JAMES S. DUFF.

Toronto, 1912. *Minister of Agriculture.*

OFFICERS FOR 1912.

Honorary President.....J. O. Duke, Olinda.
President.....J. H. Williams, Fletcher.
First Vice-President.....Byron Robinson, Wheatley.
Second Vice-President.....R. W. Knister, Comber.
Secretary.....W. E. J. Edwards, Essex.
Treasurer.....J. H. Coatsworth, Ruthven.

Directors.

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W. H. Winter, Dover Centre.
Geo. Langford, Kent Bridge.
Dan. Buchanan, Florence.
Jas. McAuliffe, Maidstone.
Jas. Martin, Amherstburg.
D. Carmichael, West Lorne.
Wm. Ford, Corinth.
A. E. Wark, Wanstead.
Jose Marentette, Jackson's Corners.
L. D. Hankinson, Grovesend.
Jas. P. Chinnick, Chatham.
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Eli Quenneville, St. Joachim.
Thos. G. Breen, Comber.
Patrick Coyle, North Malden.
T. H. Adams, Edgar Mills.
John Arner, Arner.
Ernest Gosnell, Highgate.
David Wilson, Morpeth.
Peter McKinley, Tecumseh.
K. J. Wilson, Essex.
Lester Gregory, Chatham.

TREASURER'S REPORT.

For the year ending February 5, 1912.

Receipts.		Expenditure.	
Balance on hand, Feb. 5, 1911.	$67 04	Cash prizes	$905 75
Grants:		Printing	322 79
Legislature	500 00	Directors' and local judges', expenses	222 65
Essex County	200 00	Expert judges', services and expenses	139 65
Kent County	200 00	Express, freight, cartage	59 90
Local municipalities	460 50	Storage	5 00
Town of Tilbury (special)	498 83	Corn for class work	15 00
Members' fees	335 00	Prizes at School Corn Shows.	47 00
Cash donations	75 00	Postage	73 70
Advertising in prize list	296 00	Buttons for members	18 50
Interest	5 45	Building for Show, heat, light, shelving, etc., all paid by town of Tilbury	498 83
Incidentals	24 25	Stenographer	50 00
		Treasurer	50 00
		Auditors	4 00
		Incidentals	18 41
		Balance on hand Feb. 4, 1912.	230 89
Total	$2,662 07	Total	$2,662 07

Examined and found correct.

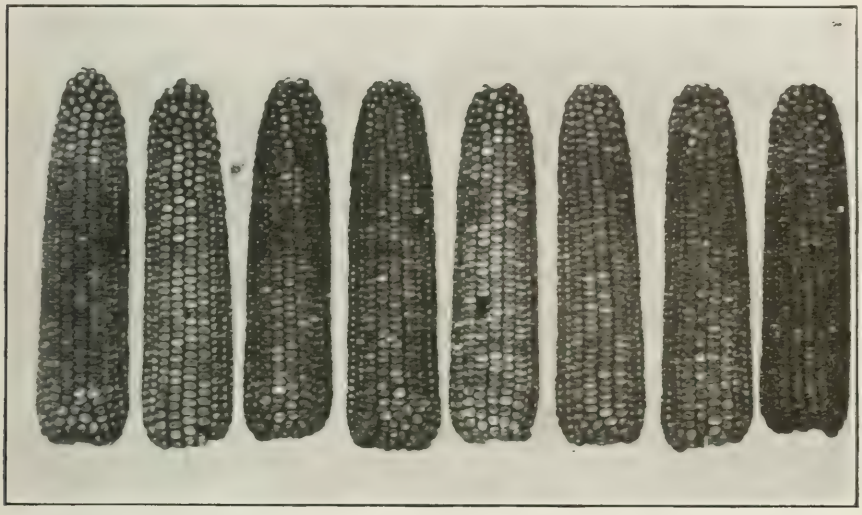
B. A. Smith
Philip C. Fox } *Auditors.*

J. H. Coatsworth,
Treasurer.

Ontario Corn Growers' Association.

ANNUAL CONVENTION.

The Fourth Annual Exhibition and Convention of the Association was held at Tilbury on January 30th to February 2nd, 1912.



EIGHT EARS OF EARLY LEAMING.

Fig. 1. This exhibit combines productiveness and trueness to breed type in an unusual degree. Early Leaming is deservedly popular with silage growers in Ontario and Quebec.

THE IMPORTANCE OF GOOD SEED.

The illustrations on seed corn, by courtesy of Macdonald College, demonstrate quite clearly the importance of seed selection and the striking differences between the different types of seed corn. Unlike other seeds, there are many more things for consideration when making selections—shape of ear, size of cob, filling at tip and butt, depth of kernel, straightness of rows, germination, uniformity, and numerous other important features must be considered. This goes to show the advisability of purchasing corn on the cob rather than in bulk, as is generally practiced throughout the Province.

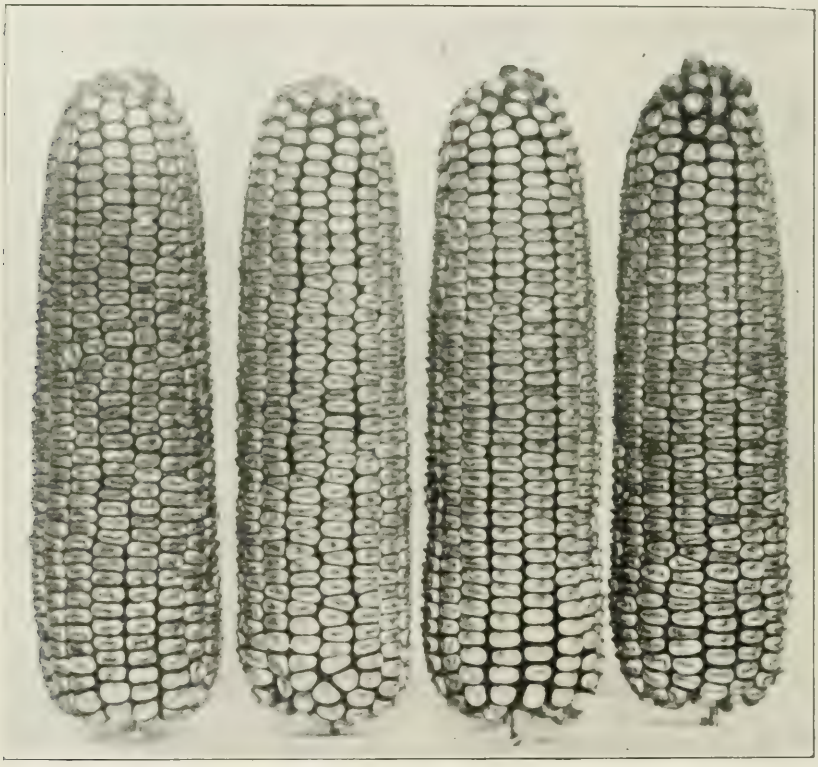
Different types of corn cribs are also illustrated which point out the importance of keeping the corn dry, thus avoiding injury by freezing during the winter and impairing the germination power of the seed. Corn growers who hope to build up a trade in seed corn should adopt the very best methods of housing and aim to sell only first-class seed of a high germination test.

ADDRESS OF WELCOME.

MAYOR W. C. CRAWFORD, TILBURY.

I wish to say that I fully appreciate the honor that has been conferred upon me by granting me the privilege of presiding over this meeting.

I believe my first duty is to extend a hearty welcome to the members of the Ontario Corn Growers' Association. I wish to thank the members of the Association for deciding to hold the convention in our town. It is not only a benefit to the merchants, but to everyone in the town and to the farmers surrounding Til-

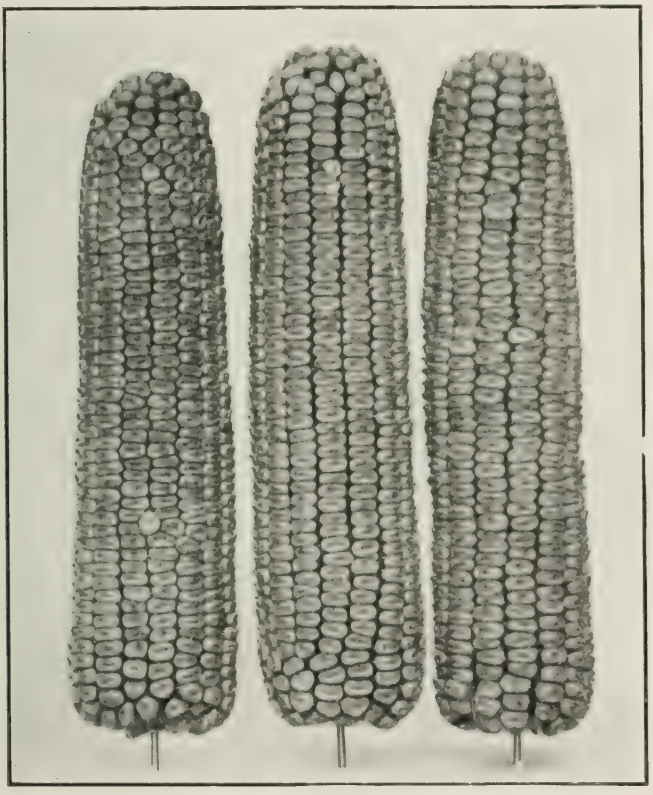


SMALL WHITE CAP YELLOW DENT.

Fig. 2. For general excellence in ear and kernel this sample would attract favourable attention in its class in any corn show. Small White Cap is an excellent silage corn for Quebec and Eastern Ontario.

bury. I think I can say that all the farmers within ten miles of Tilbury are interested in the growing of corn, and it gives them the privilege of attending these meetings, and thereby secure the expert knowledge that is so essential to the successful production of this important product of the farm. I also desire to extend hearty congratulations to the members of the Corn Growers' Association for what they have accomplished so far. There may be some in this building who are not aware that this institution is only four years old. I believe that to-day we have in this institution one that is very important, possibly more so than any other, in helping forward the great movement in connection with promoting the agricultural

wealth of this Province. I believe there are a great many people in this district who do not realize the benefits that are due to this institution. There are farmers in this district who have recently sold their farms at 50 per cent. advance as compared with the current price two or three years ago. I believe that the Americans are buying land in this district simply because the Corn Growers' Association has drawn attention to it as a corn growing district. I often feel that an Association of this character that is doing so much to promote the agricultural interests of this district as well as a large portion of the Province of Ontario is not receiving sufficient attention from the Government. No doubt the Ontario Government has been doing their best to help forward the several agricultural movements of this Province, yet many people think they are not doing as much as should be done. I



WISCONSIN No. 7. (WHITE.)
Fig. 3. This is one of the best balanced silage corns, suitable for general growing, at present offered in commerce.

am inclined to think that the vast majority of the people of this Province will support me when I say that if the Whitney Government is ever defeated that it will not be because of having spent money too freely in connection with promoting the agricultural interest of this Province.

I venture to say that seven out of ten farmers from St. Thomas to Windsor are not aware of the valuable heritage they have in the lands of this section of country. It is only those who have travelled and are best informed that are in a position to form an accurate opinion. I may say that I have been all over this

territory during the past year with prominent engineers from the continent who have travelled extensively in nearly every country in the world, and they were astonished at the wonderful fertility of the soil of Western Ontario. I pointed out that if they would call at any of the houses where there were men of from 70 to 80 years old that the latter would no doubt tell them that they had hewn out their homes from the forests.

These gentlemen look to see this district become one of the best agricultural districts of the world. The only territory that they would compare with this was a portion of the Southern parts of France and Belgium. I feel that a great many of the farmers in this Province do not fully appreciate or take advantage of the privileges of obtaining expert knowledge at a moderate cost, much of it for the asking. However, it is encouraging to find that many of the farmers are commencing to reach out for knowledge.

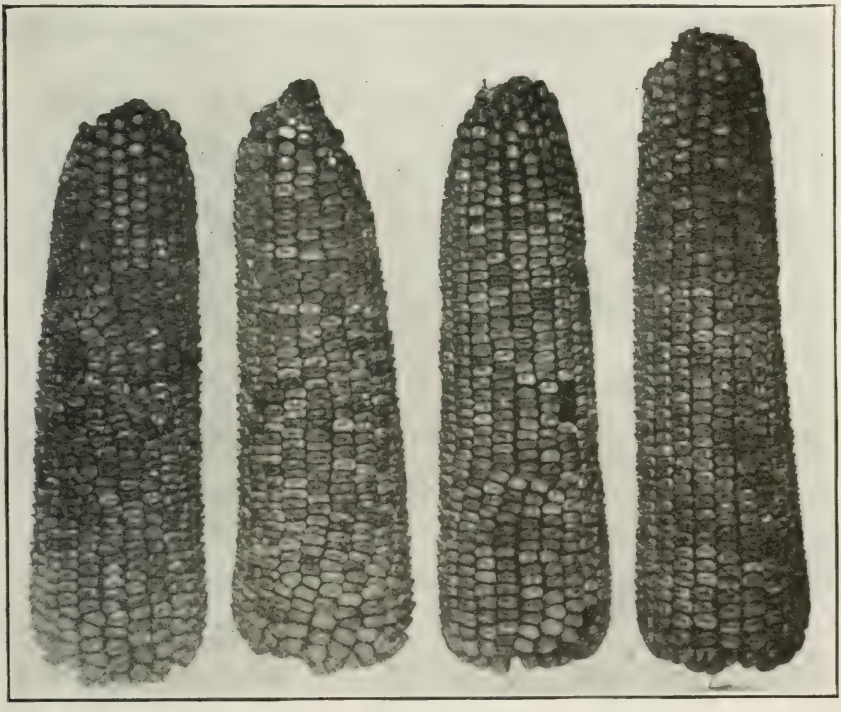
We hear a great deal of the Canadian North-West. I venture to say that the development that has taken place in the West during the past thirty years has not been equalled in any other country in that time. Yet I venture to say that the man who sells out his property here and buys property there at $15 to $18 per acre, when you take into consideration the climatic conditions and other difficulties that they are not obliged to contend with in this Province, is taking a great risk. I say to the farmers of Ontario to stick to Ontario. In view of the attention that is now being directed toward the development of all lines of agriculture, the land will produce much more per acre in a few years time. I also wish to point out that the farmers of the Dominion of Canada have the finest home market of any country in the world. You are aware that 80 per cent. of the produce of Canada is consumed in this country. Ontario will in time be a great hive of manufacturing industries owing to the cheapness of Hydro Electric Power, and this will be a great boon for the farmers, especially those of Western Ontario, where the more valuable and profitable product can be produced owing to the fertility of the soil and to its being the most Southern portion of the Province.

I may say, so far as Tilbury is concerned, that "Tilbury is the centre of the Corn Belt." Some other places have disputed that, but the centre of the Corn Belt is mid-way between Ridgetown and Windsor, and, as far as I can find out, Tilbury is near that centre. I submit that this district is the real garden of Canada. I believe the farmers of this community are only beginning to find out what their land will do. So far, tile drainage has not received the attention it should. It is a well-known fact that the better draining of the farms will increase their production at least 25 per cent. While the people in this district have been giving a great deal of attention to getting the farmers posted in the question of being able to grow the best corn at the least possible cost, yet so far in a large portion of Western Ontario no action has been taken towards improving the highways. But I hope that at an early date the roads in this district will be improved. It is not necessary to point out that for a few months each year many of the roads in the Counties of Essex and Kent are in a bad condition. There is a movement just now to have a National Highway built from Ottawa or Montreal to Windsor, and this road, no doubt, will pass through the centre of these two counties. The Provincial Government is granting one-third of the cost of highways properly constructed. If the Dominion Government would co-operate in this movement the work could be done without being a burden to the Municipalities. Tilbury Town is taking up this matter. We have already forwarded a letter to each of the surrounding Municipalities within the two counties asking them to have their representatives at the County Council take this matter up at the June Session and

devise some plan whereby the construction of permanent highways shall be commenced in the spring of 1913.

There are other matters that I would like to discuss, but there are several good speakers who will address you this evening.

I wish to say that, as Mayor of Tilbury, I grant to the members of the Corn Growers' Association the privileges of this town. I may say that I have instructed the police that if it is necessary to arrest any person during this fair that if he is wearing the badge of the Association to let him go. I take the ground that any person who is not willing to contribute 50 cents for the privilege of being a member of this Association should be behind the bars. I will say, in closing, that should the Corn Growers' Association decide to bring the Corn Show back next year we shall receive them with open arms and will cover them over with good wishes.



"Just Corn."

Fig. 4. Four ears taken from a sample of large corn shown at a recent exhibition. This exhibit furnished many excellent examples of what not to grow. Through the good work done by the O. C. G. A. such exhibits are now comparatively rare.

CORN GROWING FOR PROFIT.

Prof. A. E. Chamberlain, Development Commissioner, Great Northern Ry., St. Paul, Minn., U.S.A.

I believe this meeting is affording me more pleasure than it can possibly give to any of you. I cannot tell you how pleased I am to see so many farmers of Western Ontario assembled together to discuss the growing of corn.

I see that there are many ladies present, and if you notice that I pay more attention to them you will excuse me. When I look at this crowd it reminds me of our own country. There, we talk corn everywhere—at the fairs, on the street corners, at the picnics—wherever it is possible, but there we only speak to the men because the men think that their wives should not know anything about their farm work. At a meeting I addressed in the States there were only two women present, one, the stenographer, and the other, an old maid. We are told that the wife is half of the family and that the children are half of the family, so that when we have an audience of men only, they do not count for much, do they? But we find that when the women come to our meetings they are very much interested in corn growing. There are many women trying to help their husbands to grow good corn.

I have a special interest in this meeting because I am an Essex County boy myself. I have often driven through this part of the country. I know what you went through when you were clearing up, removing the stumps and breaking up the land, so I am specially interested in the development of this country. There is no country better adapted by soil, climate and market conditions for the growing of corn than Western Ontario.

The development that takes place in this country will depend upon the young men and women of the community. Of course the old men are good men and they have made this country what it is, but if I should come back here to address you in 20 years from now, it would not be the old men of to-day that I would address. Let us stop to consider the conditions that the young men will have to face. Looking at his little boy, a father was speaking to me about how different things will be when the little fellow is grown up. He said that instead of a population of 90,000,000 people, it would be 120,000,000, and that instead of land selling at $50 per acre it will likely be sold at from $200 to $500 per acre.

The same prophecy may be applied to your country also. At present the unoccupied territory in your North West is of vast extent and your soil out there is of a rich quality much like ours, but Americans are crossing the borders in great numbers and the people of all nationalities are pouring in, and your great country will soon be filled up with settlers. When this prophecy is fulfilled the conditions will be greatly changed from what they are now.

The farmers must get their heads into their work. I am not here to tell you to work longer hours in the day, or to work any harder while you are at it, my text for the men on the farm is to get in more head work. Some men seem to slave away many hours a day and yet accomplish very little. I question if these men read the Bible. The Bible says, "A man shall earn his bread by the sweat of his brow." Most men leave their heads out of the game, and make a poor living by the sweat of their backs and the sweat of the backs of all the rest of the family.

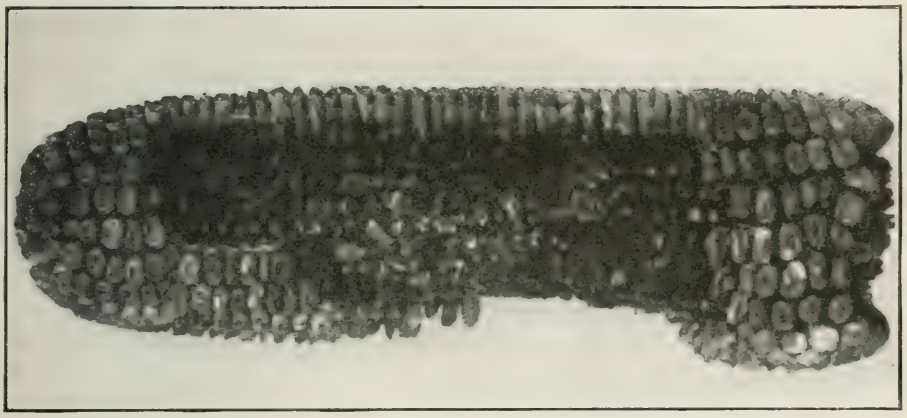
I came here to talk about corn and I like corn. It is my hobby. Do you know the difference between a hobby and a horse? A fellow can get off his horse when he feels like it but it is a terrible job to get off his hobby.

You cannot find a state in the world where corn growing has been carried on successfully, where the yield per acre of the other crops, wheat, oats and barley has not been increased. Tell me the average yield of corn per acre in any part of the U. S. and I can tell you nearly what the selling price of the land is in that part.

You can easily get up a friendly rivalry about the raising of corn. When you get this friendly competition up, the next thing wanted is better farming, more approved methods and better cultivation revolutionizes farming. The best farmers

all over the world are scientific farmers. Some farmers are scientists because they have studied nature and have found out better ways of farming. You people cannot beat Mother Nature. When you try to beat her you beat yourselves. A scientist is a man who has delved into nature and discovered some of her laws. A man that sneers at scientific farming is making a fool of himself. A few of you have sandy land, and more of you have clay land, but there are underlying facts which apply to corn growing everywhere no matter what the soil may be. Some of you possibly think that judging corn by the score card is a very poor way. The score card is only a method of calling attention to the reasons for the decision, to be considered in judging corn.

The first point to be considered in judging corn is trueness to type. There is not a man in the audience but would not like his horse to be a true representative of its breed. The same principle should govern you in selecting your seed corn.



A Type of Ear Difficult to Mature.

Fig. 5. This ear is much too short and thick. As a result the ear, when stored, heated and moulded so badly that the vitality of the seed was destroyed. This ear was taken from the "Just Corn" exhibit, four ears of which are shown in Fig. 4.

If you do not use great care in the selection of your seed you cannot get the best results. When we find an exhibit of ten ears that are all alike we know that there has been good breeding as uniformity is one of the best indications of highly bred seed corn. (Showing an ear). You lose an ounce of corn on each of these ears. They should be well filled out at the point and the kernels should be all of the same color. We want a red cob for yellow corn and a white cob for white corn.

The next important question regarding seed corn is "Will it grow?" I was at a corn show in one of our states where the judge said that there were only two entries that seemed to have good growing vitality. The kernels towards the point of the ear and the butt of the ear must be well filled out. Straight rows are also very important. You cannot put as much corn on an ear if the rows are not straight. Then there is a difference in regard to the shape of the kernels. I once saw two ears of corn that looked exactly alike but upon weighing them it was found that there was a difference of 2 ozs. in their weights. The difference in weight was accounted for by the shape of the grains. On one ear the grains tapered toward the tip, while on the other ear the grains carried their size almost all the way to the point and occupied the full space provided for them. Every

good farmer gains by harvesting his seed corn from the field in the fall. The time for frost differs in different parts of the Province. In some places it is expected from Sept. 15th to Oct. 1st. When the time comes that it is cold at night you should have your seed corn picked and hung up to dry.

In the selection of seed corn it is not altogether a question of the ear but the stalk it grew on is also very important. Did the stalk stand up well? Is it a healthy stalk? How high did the ear grow from the ground? These are questions that should be considered. Many have trouble with yellow corn because it grows too high from the ground. By care in selecting the seed from ears that are grown on the stalk a certain distance from the ground you can, in three years, develop a type that will grow from 95 per cent. to 100 per cent. of the ears at that height. I have seen it tried and it comes true every time. The higher you get the ear from the ground, and the more joints there are of the stalk between the ear and the ground, the later it will be in maturing. Down South they pick their corn from as high as they can reach, but corn that grows high is much more likely to be frozen. It is the old story, "The survival of the fittest" not of the best. The reason you should select your corn from the stalks that are near the ground is that the joint nearest to the ground feeds from the ground, the second one feeds from the first, the third from the second, and so on. When the corn begins to get ripe the joint nearest the ground dries first, and the nearer the ear is to the ground the earlier it matures. I think that here you should not select your seed corn higher than the fifth joint and that at the fourth joint would be better.

The largest corn is not the best. Large corn requires a warmer climate and the farmer in this section who raises it is making a great mistake. If the stand is uniform, large varieties are not necessary for big yields. Here is an ear that weighs one pound. If you grow three such ears to the hill you would get about 140 bushels to the acre. Here is a smaller one that at the same rate would produce 85 to 90 bushels per acre. Now why are you not all getting from 85 to 90 bushels of corn to the acre? You plough enough acres and possibly cultivate it enough to bring this result but you have a great many stalks that are not producing anything.

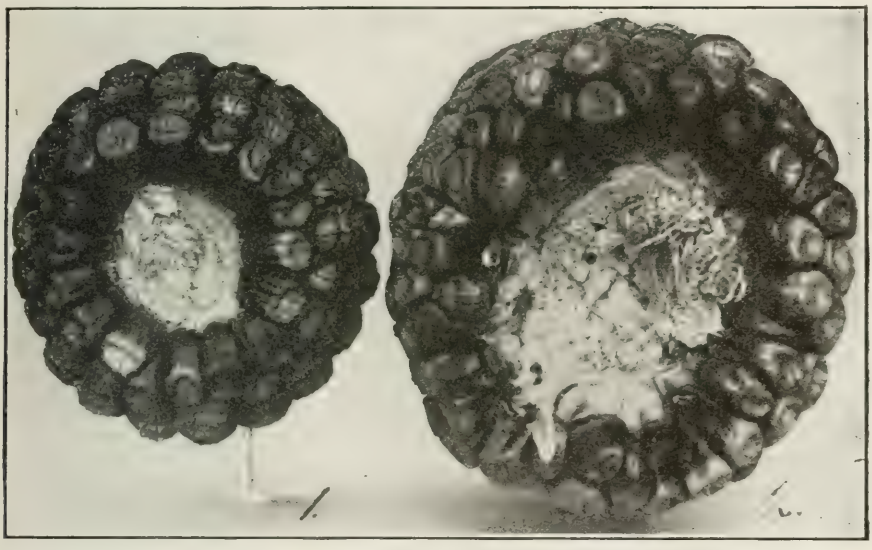
If you plant corn next spring that did not ripen until the 1st of October the crop next fall it will likely ripen about the same time. When you gather your seed corn hang it up and take care of it. There is no advantage in gathering seed corn early if you throw it down in the barn or granary. The best place to put it is in the middle of the parlor floor because if you put it there your wife will hang it up. Hang it up in a dry place where it will get plenty of ventilation and be safe from vermin, and if it is thoroughly dry it will not freeze. Strong vitality is also very important. Find out if you have seed that will grow. There is not one of you who can afford to overlook this important matter.

How To Test Seed Corn.

It is easy to test Seed Corn, and it takes but little time. Make a shallow box 30 inches long by 20 inches wide by 3 inches deep, inside measurements. Any size box will answer but the above size is very convenient. Fill the box about 1½ inches deep with damp sawdust or sand. Over this sawdust place a cotton cloth ruled into spaces 2 x 2 inches. Number the spaces along the top of the box from 1 to 15 and along the left hand edge from 1 to 10. In this way each square can be located readily.

Having selected the corn to be tested, take each ear; in the butts drive a nail to hold small pieces of cardboard numbered from 1 to 150. Take ear No. 1 and

remove two kernels from near the butt, two from the middle, and two from near the tip, from opposite sides in each case. Do not take all the kernels from one place or from one side of the ear. Place six kernels in space No. 1 with the germs upwards, and the tips pointing down. After all the spaces have been filled, place a cotton cloth over the kernels very carefully. Then put on another large cloth that laps over the box a foot or more in all directions. Fill up the box with sawdust or sand, fold edges of cloth over top, and dampen with warm water. Place in a warm place and keep moist. In about five days the test will be complete. Lift out the top cloth containing the sawdust and then lift the next cloth off very carefully. Start at No. 1 and throw out all ears that did not grow. Keep only those ears in which every kernel of corn grew, and that germinated strongly. If seed corn is limited, keep those ears in which five kernels out of 6 grew, and in no case plant for seed, corn of poorer germination or that germinated weak.



GOOD AND POOR BUTTS.

Fig. 6. Ear 1 possesses an ideal butt; Ear 2 represents a type altogether too much in evidence at some of our corn exhibitions. No. 2 came from the "Just Corn" sample of Fig. 4.

By testing 150 ears at a time, seed sufficient for 12 to 15 acres may be tested at once, if seed is good. By having more boxes larger amounts may be tested quickly. After testing and throwing out all poor ears, remove the tips and butts of the ears and plant the remainder.

The only way to be sure you have good Seed Corn is to test it. As a rule replanted corn amounts to very little.

The old way of testing corn was something like this. The farmer would go through his seed corn and select the best looking hundred ears and take one kernel from a number of ears. He would get a box of nice, mellow earth, get just the right moisture and plant them in it. He would then set the box in the kitchen window and sit nervously watching it. The family had to be very quiet because "Dad was testing seed corn." After a while one grain would come up and the farmer would keep wondering how many more would come through. Some of it would not come up for two weeks. Now, corn that will not come up for two weeks

in the house will never come up in the field in a cold season. This method is better than not testing at all, but is much inferior to the former.

Many farmers go to town leaving Billy to plant the corn. Then a little later they go out to the field on a Sunday to see how the corn is progressing. They see nine good rows and one missing. Then what happens Billy? What is the difference between you and Billy? Billy was honest. He picked out the 10 per cent. that would not grow and planted it all in a row. But many of you fellows who do not test have been mixing the poor corn all through the field. Most of you who had only 40-60 bushels to the acre only grew six or seven grains out of ten.

Some time ago a friend and I drove through the country in our state inspecting the corn crop. We counted the number of stalks to the hill in 15 or 16 ordinary fields but at last got into the best corn field that I was ever in. Almost every hill had three stalks and each stalk an ear. In contrast to this we stepped over a barbed wire fence into another field and found sometimes one, two or three stalks to the hill. We had counted about one hundred hills in this field when we saw the owner, an old man coming towards us. He was not chewing, but eating tobacco. He never once looked at his corn field. I asked him where he got his seed. He replied that he took great care in selecting his seed and while he was talking he stepped on a hill with five stalks in it. When you have more than three stalks to the hill it is as bad as less. I said to my friend that I would like to meet the man that owned the good field of corn. We found that it belonged to a German. He had a good head. There never was a man who could earn a dollar a day at anything with his body from the nose down. Brains count in farming probably more than in any other line of business. We asked the German how he selected his seed corn. He said he tested the ears and just planted those that grew up strong and quickly. I asked him how he got three grains in every hill and if he used a grader. He said, "No, that cost seven dollar. I look over my seed corn and see one that has too big a kernel. I throw it out. Then I see one with too small a kernel and I throw it out. Then I find one medium and I use that." The result was that he had 93 per cent. of a stand of corn. He said he planted it on the 10th day of May and his neighbor with the poor field had planted his on the same day.

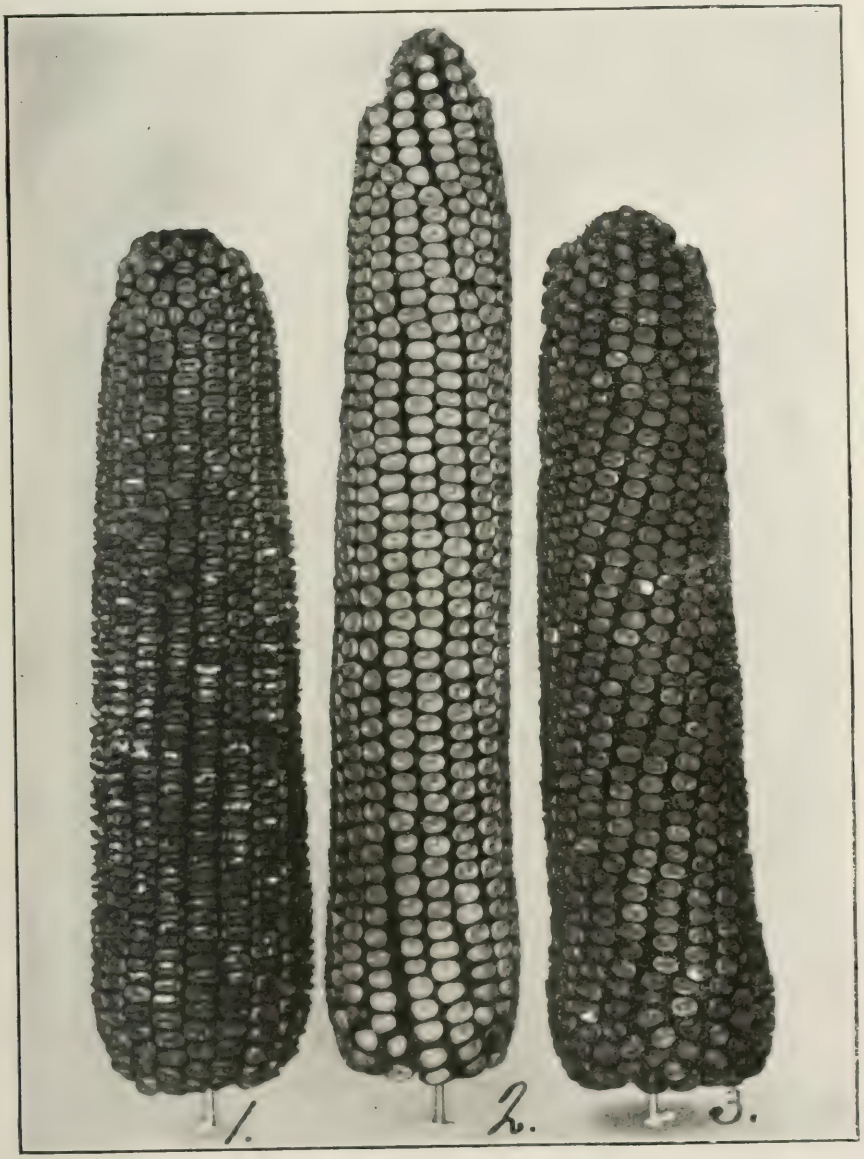
Did you ever stop to think what it means to plant an ear of corn that will not grow? We will count it this way, 16 rows to the ear, 35 kernels to the row, 560 kernels of corn on that ear. Then plant three kernels to the hill gives us 186 hills. That would plant a row about 35 rods long. Suppose you plant but one ear that will not grow to the acre, it means that you are losing one 35 rod row per acre. This is a very important question to every corn grower.

Your conditions are not like ours but do you not often do something like this. Plough the weeds under, then go across the field with the drag and call the field ready for planting. Let me tell you how they do in our country. They double disc the land before they put the plow into the field. Then they plow it under and make a good seed bed.

You have one great draw-back here, that is lack of drainage. Corn demands a warm seed bed and you cannot have a warm seed bed without good drainage. The great thing is to get the water off your land. Another important point is to keep down the weeds and cultivate early in the spring to prevent evaporation. We find that in hot countries the labourers take drinking water to the fields in earthen pots, which they set in the sun. The temperature is often 117 degrees in the shade but that water is cool. If they set them in the shade the water is warm. The evapor-

ation reduces the temperature. The same principle applies to the soil. If it contains an over supply of water, the evaporation is great which makes the soil cold.

You could not raise a crop of anything in this country with the amount of rain that falls during the growing season. We must conserve the moisture that falls during the autumn and winter. Deep cultivation, especially if the spring is



SOME COMMON TYPE OF EARS.

Fig. 7. Ear 1 is an excellent seed ear. Ear 2 is a good example of an ear showing poor constitution. Nos. 2 and 3, while possessing comparatively smooth, shallow kernels, are later in ripening than Ear 1. A few samples conforming to the type of No. 2 are still shown at exhibitions. Fortunately their number is rapidly decreasing.

cold conserves the moisture. After that the cultivation should be very shallow. From an experiment it was found that the roots of the corn spread out into the row when the corn is knee high. Therefore, deep cultivation later on cuts off the roots.

The Eastern part of the Province is into the business of dairying. There will be a great demand for seed corn from Eastern Ontario and it will pay you to study their conditions and find out the kind of corn they want. It would be a good thing if the Association would test every bushel of corn that is sold for seed. Then you would soon get a great reputation for good seed. I think that would be a great advantage to the farmers of this section of country.

I want to say, too, that you have something else to do besides working in the fields. Farmers, make yourselves a part of every movement in your community. You know that you are not getting anywhere in Canada more than 10 per cent. of the revenue for the purpose of building up agriculture. I like to see your papers speaking on building great battle-ships to show loyalty to the Sovereign, but tell every politician you meet that agriculture is the great industry of this part of the country, and that it needs building up far more than does the navy.

Stir up the members of Parliament to do better work for a better country. Get them convinced that you want Domestic Science and Agriculture taught in every school in the country. When you take twelve years of a young person's life in attending school do not turn them out helpless. In our country we have central High Schools in each Township where they teach Domestic Science to the girls and a trade to the boys.

It is all wrong to say that you want to give the children an education so they will not have to work as hard as you have done. No man ever made a success of anything without putting his whole heart and soul into it. What you want to do is to give the children better ideas how to do their work.

ENSILAGE FEEDING.

J. H. Grisdale, Director of Experimental Farms, Ottawa.

The question of growing corn for ensilage is one that, judging from what I saw as I came through the country, and what I have seen in previous journeys to and from Western Ontario, does not receive much attention in this district.

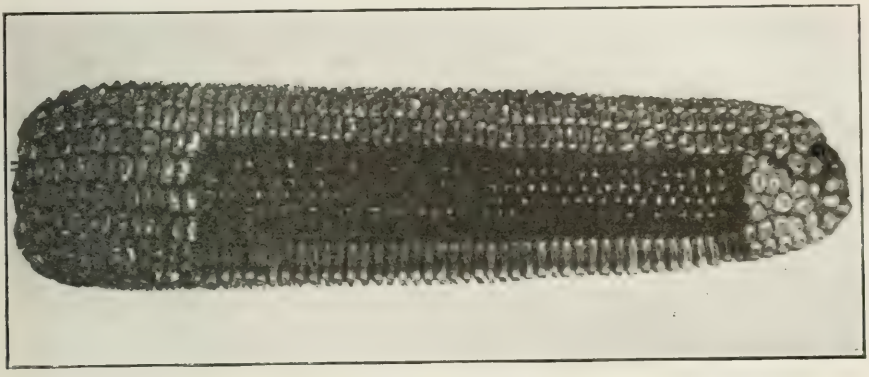
I take it that the aim of your Association is to increase the production and improve the quality of corn. The ambition and aim are excellent. I think however, that growing a certain proportion of your corn for ensilage would help rather than retard progress. We live stock men in Eastern Ontario, in Quebec and the Maritime Provinces, and in the prairie provinces and British Columbia, are growing more crop for ensilage year by year. It is up to you Western Ontario farmers to give us better seed and seed better adapted to ensilaging purposes.

Ensilage is a very wide term and in discussing ensilage feeding, in some parts of Canada, I have found it necessary to ignore corn entirely. We can make ensilage out of practically anything we can grow on the farm. But to-night I shall confine my remarks to corn ensilage.

It is upon the ensilage-making qualities of your corn that your market in the east depends. In the first place, the variety of corn to grow is very important. You want a variety that will mature in the part where it is to be grown, not

occasionally, as when the season is particularly favourable, but one that will grow to its full size and will practically ripen under average conditions in the district where the ensilage is to be produced.

We, in Eastern Ontario, find that we can get suitable varieties from the western counties of the province. We find, however, that we can handle your smaller varieties to the best advantage. We, at Ottawa, like a mixture of varieties, say one quarter of White Cap Yellow Dent, one half of Leaming and if the season is particularly favourable, we might try one quarter of Reid's Dent or Early Mastedon. But if the land is not in very good shape and the spring late, we try smaller varieties say Longfellow one quarter, White Cap Yellow Dent one half and Leaming one quarter. I believe you would find such a scheme satisfactory in this district also. I judge your conditions by the quality of the seed you ship us. Very often we get seed from this district more or less affected by mildew, showing that your seed did not ripen properly.



A Good Seed Ear.

Fig. 8. A well-shaped ear, which carries its length of kernel well up to the tip. The absence of space between the kernels at the cob is particularly worthy of note. Such ears not only shell out a high proportion of corn to cob but give kernels of the best conformation for seed.

At the Experimental Farm, we are greatly interested in your success in corn growing. We are often asked where to get good seed, and we usually direct enquirers to this district. I tell you, though, that if you wish to build up a trade in seed corn, be sure you send good seed. Some eastern men have received bad seed from Western Ontario and they are prejudiced against you. We, at the Experimental Farm, buy and distribute a good deal of corn. Last year I bought about 300 bushels from here subject to test. Every farmer should buy seed that way.

Q.—Do you ask a guarantee that corn should be true to type?

A.—We do not mind a little variation but we want ears that are well filled up.

Q.—What plan would you recommend to the Association, in order that they could guarantee the seed that the members send?

A.—I have not though much about that subject. We have been trying to help the men who are buying the seed.

Q.—Would not this be the proper end to start with?

A.—Possibly it would, but it is, I think somewhat out of my line. I am not the Seed Commissioner; I know, however, that he is very much interested in the building up of our Canadian farms through the feeding of ensilage, and he will, am sure, do all in his power to help you in this and co-related matters.

Next in importance to variety is the question of cultivation. You here, are not tempted to sow it from 15 inches to 16 inches apart. I have noticed fields where the hills looked to be 4 inches apart. If I were speaking to an audience in the east, I would emphasize the importance of planting in hills a good distance apart. When you are growing in hills or rows far apart you are at the same time doing all you can to encourage the growth of stalks and leaves, while the grain is, at the same time greatly benefitted. Thus we do ensure the best general result, for while the ear is nutritious and palatable, the stalk and leaf are also exceedingly valuable, and they add a spice and a satisfying bulk that the grain does not possess.

Inducing rapidity of growth is another important matter. This is of course a matter of cultural method and season, but everything possible should be done to accelerate growth while the weather is favourable. Last year we had a bad season; it was wet until the first of July, then every dry and we find our ensilage inferior in quality. I see too by some samples in the show that your season was not much better than ours as far as being suitable for corn growing was concerned.

After you have the corn grown, the next consideration is when to cut it. You can cut it too green and you can cut it too ripe. It is quite unlikely that any farmer will let it get too ripe; it is probable that you will get a larger tonnage and a more palatable article if you cut it when the kernel is in the dough stage and has just begun to glaze. It is some times cut when the corn is in right condition for boiling, i.e., the milk stage. You ask, "Will it keep in the silo when cut at that stage?" It will be good feed but it will not be quite so nutritious and it will lose a greater proportion of its nutritive value.

If you get your corn cut in the right stage the next question is the getting of it into the silo. I remember being on a farm a few years ago where the farmer had obtained a good variety of seed, but when it came to putting it into the silo he got a cutbox that cut it into lengths of about 2 inches. I told him what was wrong with it and he sent a sample to us to be analysed. We found that the ensilage had only about three quarters of its normal food value and was slowly deteriorating.

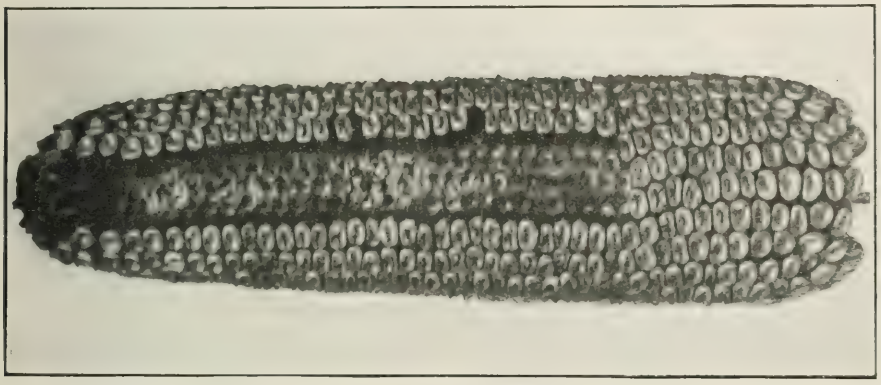
Set your cutting box to make it as fine as you can—the finer the better. Then if you are getting it into a dry cement silo, be sure that you use sufficient moisture around the walls to preserve it. If you have a cement silo improperly finished in the inside, you will find it hard to keep the silo from absorbing the moisture from the ensilage and you might easily have from 6 inches to a foot of ensilage all around the silo wall of poor feeding quality.

If your corn is dry, or if your silo is poorly constructed, or if it is a dried out stave or wooden silo, you must provide for the loss of moisture by putting a considerable quantity of water around the walls as you fill.

When it is filled, the next point is the emptying of it. This process is quite as important at almost any season. Complaint is often made of ensilage freezing around the walls. This is an easily avoidable or easily overcome difficulty. This is how we do it: Our silos are made of staves: we take ensilage out about every two days, and we take it down about three inches lower at the wall than at the centre. Now the mass of ensilage is such that it takes a few days to bring it to the freezing point. When it is lower around the walls it leaves a greater mass in the centre, the heat from which goes to the wall and prevents it from freezing so quickly. But should some freeze around the walls, as may occasionally happen, the loss is nil. As already indicated we prepare food for two days at a time by mixing cut

straw and ensilage. We take the ensilage to the feed room and break up the frozen lumps. We mix it with straw and pile in deep piles so that by the time we come to feed it it has heated slightly and no frozen lumps exist. Freezing the ensilage does not hurt it; but feeding frozen ensilage might do some harm to the cattle if given while still frozen. I am sure that we do not lose a hundred weight of ensilage a year from frost. The silo, when properly handled can be kept in good shape from top to bottom.

When the ensilage is out of the silo there are several things to consider before you can be sure of having it fit to feed. Do not take it out in piles and let it lie until next week; take it out to-day and feed it to-morrow or next day. I believe that the addition of cut straw or hay will both make the stuff more palatable and very certainly add to the value of the ensilage—especially is this true if the ensilage is not as good as you would like to have it, or if the hay or straw or chaff are



A Badly Decayed Cob.

Fig. 9. The only outward indication of unsoundness shown by this ear was the slightly darkened centre of the cob at the tip. So badly decomposed was the cob, however, that the rows of kernels could easily be pressed down a quarter of an inch. This ear was entered in the class for best Single Ear of White Corn open to Ontario.

of rather inferior quality. Ensilage is, therefore, an economizer of cost because you can utilize other cheap feeds by mixing them with it. The mixture should contain not over 25 per cent. of dry forage. We are careful when threshing to keep our long straw in one pile and our short straw or chaff in another. This facilitates matters at feed mixing time.

We feed ensilage twice a day. Twice a day is, I think, the best method. We grow about fifty acres of corn a year and we carry from 150 to 200 head of cattle on a 200 acre farm.

We have also many pigs. We grow enough rough feed for our stock of swine, cattle and horses. It is our aim to get them to eat all the rough feed that they will. We find that the cheapest and coarsest feeds are the most wholesome and profitable feeds. In order to get every animal to eat all that it will, it is our aim to make the feed as palatable as possible. Corn ensilage is our great appetizer as well as our main forage supply. It must, however, be studied and fed judiciously. If it is wet, add straw, and if it is too dry add roots, or failing roots, a little water and some salt. Make the ration so palatable as to be irresistible to the average cow. That is the time that the animals are making money for their owner.

Any meal we are feeding our stock is mixed with the ensilage. We scatter it on the ensilage and mix them together. A little hay, with cornmeal, shorts or bran mixed with the ensilage makes the cow smile.

When you have learned how to feed ensilage, it will not take long to find where it is valuable.

As you know, the chief industry followed at Belleville is dairying. Ensilage is the cheapest feed for dairy cows. It is undoubtedly the best milk producer that a man can feed. It is the greatest point in favour of corn ensilage. It is in this case both best and cheapest. It is the dairying districts that you people wish to supply with seed corn. The dairying industry in Canada is growing. Draw your own deductions.

As a food for beef cattle, too, corn ensilage cannot be surpassed. We feed anywhere from 40 to 70 steers every year and we have tried all kinds of ensilage and root and hay mixtures that we have heard of. But I know of no food that gives better results than corn ensilage. I sold a bunch of steers last month, which the owner took to the Fat Stock Show at Ottawa and took many prizes with them. These steers were fed on ensilage 365 days in the year and corn ensilage at that. There is no feed that will produce beef at a lower cost or of a better quality either, as I can testify.

We have found that corn ensilage is not very good for fattening pigs, but for brood sows it is valuable. Horses that are not doing very much in the winter will do very well on it when you add some grain to it. Thus ensilage is valuable to all kinds of stock, even to the chickens. We tried that but I do not remember the results. Before I was Director, I was interested chiefly in agriculture but did not pay much attention to the poultry. And if ensilage can be produced more cheaply than any other food on the farm and will give as good results and is more easily handled, it merits careful consideration.

Every farmer must improve the soil on his farm. Do not imagine you can handle a large farm in any old way. It is not the size of your farm but the care with which you work it that counts. You will be astonished at the returns you will draw from it every year if it is worked thoroughly and to the best advantage.

Q.—Do you grow sweet corn for ensilage?

A.—Yes, we have used it for ensilage both after the ears had been harvested for cooking purposes and also when at the same stage as we use other corn. Where we used sweet corn we found it was eaten greadily by the cattle. I would not say it is as valuable as average corn, but think the fodder or stover to be quite as valuable as average corn fodder, acre for acre. Where sweet corn is grown for canning purposes, I would say by all means can the corn stalks in the silo.

In Prince Edward County where dairying operations are carried on extensively, I am told that the farmers get better results from the stalks of sweet corn than from ordinary whole corn, ton for ton.

Q.—Do you consider that corn that produces 75 to 100 bushels to the acre would need meal added?

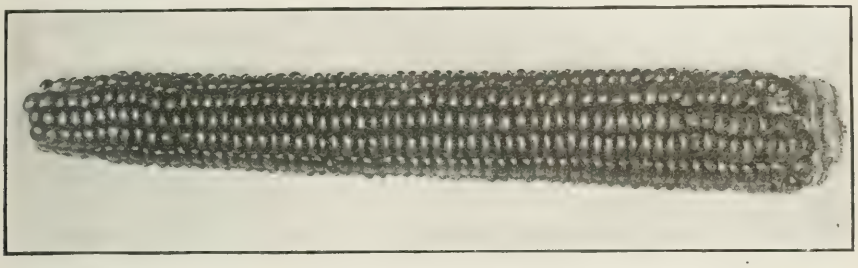
A.—It would depend on what you were feeding for. If you are just feeding your stock to keep them over winter, no meal is required. If you are feeding your cows for the purpose of milk-production, or if you are trying to fatten your stock, the addition of a little meal of a suitable variety, say bran or oil cake meal or cotton seed meal—something that will increase the flesh producing qualities of the animal should be added.

Q.—Can you feed alfalfa with your ensilage?

A.—It makes a splendid combination. The alfalfa will take the place of the meal.

We have a rotation where corn enters every fourth year—corn, grain and hay (clover and alfalfa). One hundred and twenty acres of the farm is included in that rotation. Following that rotation has enabled us to more than double the return per acre within twelve years. This is, I consider, due in no small measure to growing corn for ensilage. I would not say what the effects of growing for grain would be, for where it is grown for grain, there is a great temptation to sell the corn, but when grown for ensilage, it is feed on the farm and increases the crop growing powers of the farm. If you will introduce a rotation where a certain amount of your corn is grown for ensilage for feeding purposes, I venture to say that in a short time you will find your land so much more fertile that you will be more than repaid the apparent loss in seed corn growing power, to say nothing of the returns from the ensilage fed.

To grow corn for ensilage requires much less expense and hard labour (provided you get the right kind of cultivator and cultivate two rows at once) than root growing would require.



An Ear of Flint Corn Injured by Freezing.

Fig. 10. Freezing in ear corn is generally most in evidence at the butt. This is particularly true in flint varieties. In testing corn always examine at least one kernel from the base of the ear.

Ensilage helps to utilize every kind of rough feed on the farm. Wheat straw is not a palatable food, but if you have good ensilage you can feed most of your straw and chaff and of course oat and barley straw. The more the average cow or steer eats of this forage, the better they digest. It seems to stimulate their digestive organs and make them work with less danger. I believe that the growing of ensilage is the greatest scheme to increase farm productiveness that can be devised. Every good farmer in Eastern Ontario, east of Belleville, has a silo. The Government has sent us through Quebec to speak on the advantages of growing corn. Last year I sent 250 bushels of seed corn grown in Essex, Kent and Elgin Counties, to be tried in the Province of Quebec. I went in May to show them how to plant it and again in July to show them how to cultivate it. To-day what is the result? Last year there were 400 silos put down in Quebec. I expect there will be 1,000 this year.

My principal reason for coming here on this occasion was to urge upon you, the Corn-Growers of Canada, the men who grow seed, the men, therefore, who hold the destiny of the dairy industry in their hands, the Corn Growers of Essex and Kent, that we want you to send us *Good Seed Corn*. Better let us do without seed corn than send us bad seed. Send us good corn and I can promise a market that can take every bushel of good seed that you can grow.

Q.—Is there any danger of these Eastern people spoiling the corn after it is shipped?

A.—There is no danger if you ship it in crates. Do not ship it too early in the season. You know better how to take care of it until near planting time. The Eastern farmer sometimes shells it on the first rainy day after he gets it and puts it away snugly and safely as he thinks, but it often heats. I have seen corn come down there that looked as if it had been kept in the same way here.

Q.—Do you buy shelled corn?

A.—When we have to buy corn from the U. S. it is all shelled. If you find that you cannot get your corn dry enough to ship shelled, it might be better to send it on the cob.

Q.—Could you suggest a plan for the Association to adopt so that they could guarantee the seed sent by the members?

A.—You will have to devise methods and regulations for yourselves. Would it not be a good idea for your Association to prepare brief directions for the purchaser enclosed in an envelope on the outside of the box? Have them printed in both French and English, and if you would send a copy of the proposed directions (you not being used to the conditions of the soil, weather, etc., in the East), to experienced men in the east before having them printed, we would be very glad to help you.

Q.—Do you think it advisable to kiln-dry corn?

A.—You may dry it in this way, so long as you do not raise the temperature too high.

Q.—Do you test the corn sent to you?

A.—We do when time will permit.

I have spoken almost entirely of the eastern market, but I must say that there is also a western market. Part of Manitoba, a large proportion of Saskatchewan and large areas in British Columbia, will require seed corn. These will require some of the hard small varieties,—White Cap, Yellow Dent and Longfellow are good varieties—and will be asked for more and more.

I think that if you could get in touch with the seedsmen out there, they could handle some seed already.

AGRICULTURE IN THE SCHOOLS.

Prof. S. B. McCready, O.A.C., Guelph.

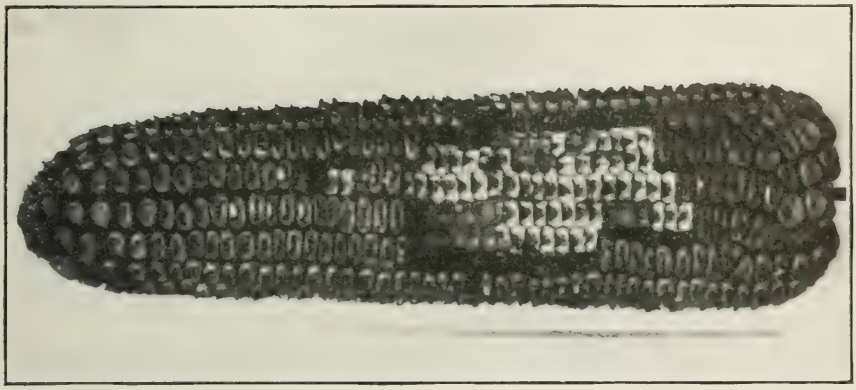
I have come here this afternoon as a representative of the two Departments of Education and Agriculture of the Province of Ontario to help to show you as far as I can what possibilities lie before you for the advancement of Agriculture through Education.

There is a new era dawning in Ontario. When one goes from place to place he cannot help thinking that there is a new Ontario in the making right now. You people here to-day represent in one little corner the new interest that is being felt all over Ontario in many lines. I can see that Ontario is awakening. I see it at such places as our Winter Fair at Guelph, the Seed Growers' Association at Ottawa, the Fat Stock Show at Ottawa, and here at this wonderful Corn Show. Wise people are trying to see what can be done to better conditions. I do not know

of anything better for you to feel than that you have here in Ontario one of the best farming districts in the world. I find that such a feeling is always a source of human pleasure.

Wherever you go in Ontario, the people think that they have the best part of Ontario. If you go, for example, into the Niagara District you find that the people there think that they have the Garden of the World, and I am sure that you people think that there is no place like Elgin, Kent, and Essex. This means that the Province of Ontario must be a very good place, since every man thinks that his part is the best.

It is a great privilege to be so well situated, and a great privilege to feel also that the work of making the country is not completed yet and that we may have a hand in improving it. Ontario is the best part of Canada and the best part of North America! But there is something else besides good soil in Ontario. Ontario has good schools! I do not mean to say that they are perfect, but, as a whole, they are amongst the best schools you will find in any Province or State in North America.



TIP CAP AND LOWER PART OF GERM REMAIN ON COB.

Fig. 11. Numerous ears with this disqualifying defect are shown at corn shows. Obviously such ears are worthless for seed as the young plantlet remains attached to the cob. The only outward evidence of this defect is a slight elevation of the injured rows. Had the exhibitor removed a few kernels from this ear he could scarcely have failed to detect the broken kernels.

The great problem is the improvement of the public schools along vocational lines. It has come into the minds of men that schools have to take new directions; that the old ways are not the best, and that the schools should have well-equipped teachers to carry out the work of educating for efficiency, people that never go past the public schools.

Moreover, it is felt that the work done in the schools should better accord with the interests of the home and the community; that the boys and girls leaving school should be equipped to "live a life and earn a living." That in the country schools instruction should be given in agriculture.

Ever since our system of education was organized, the teaching of agriculture has been in the minds of our educationists. Forty years ago Dr. Egerton Ryerson prepared a book on agriculture for use in the schools, but it did not suit and was not used. Twenty years later the Educational Department authorized another book prepared by Mills and Shaw. A third book, written by Mr. C. C. James, was

authorized. But the teaching of the subject through a book has always proven unsatisfactory. The old idea was that you could learn only out of books. We are getting away from that idea now.

A new era dawned when Nature Study was introduced into the schools about eight years ago. Nature Study is very closely related to Agriculture; it is Agriculture! it is the study of plants, of animals, of soils, of weather. There are many things of great benefit to the children that may be taken up, as the different varieties of grain, weeds and their eradication, insects injurious to the orchard, climate and water, etc.

It is my duty to go through the country to help introduce this work. Naturally we find the older teachers handicapped because they were not trained to this work. The newer teachers, being more recently trained, are handling it in the right way. Now if the teacher in your school is trying to arouse an interest in your children in this study, assist her, encourage her, and do not interfere. Your children are being instructed in the wonders of nature. These studies will influence their lives after they leave school. It will make them better farmers and better students. Nature Study is not a fad, but it is the most natural thing that is being taught in our schools to-day; it will revolutionize other studies. Arithmetic will take a new form when it is the Arithmetic of the soil, weeds, etc. If the teacher in your school is taking it up, encourage her and help the children. If you have the experience of other people you will be going to school again with your children learning about birds, animals and plants, that you never learned about in your school days. I do not wish to say that the teachers do not make mistakes. They may not always choose the right topic to suit your interest. The teacher may be teaching about grasshoppers instead of your corn crop. Tell her that corn is your nature study. Your Inspectors, Messrs. Smith and Colles, are doing their best here to get every school in the country to take up practical studies with corn. Everyone should encourage this kind of nature study.

And do not lose faith in your schools. Great harm comes when you lose faith in anything you have trusted. Ontario does not need to be ashamed of its schools. We are making decided progress in many respects and in introducing Agriculture stand second to none in America. The Education Department believes that Agriculture cannot be learned from books alone. They believe that it must be learned in the practical way. And to carry out this idea school gardens are advocated.

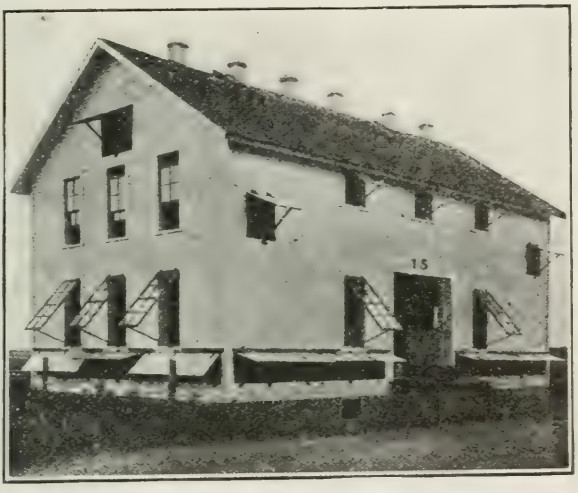
For this work, liberal grants are paid. The Government will give $50 the first year to pay all expenses. It will give $30 for every succeeding year that the work is carried on to cover expenses. We will give the teacher that carries on this work successfully $30 each year. To carry on the work 250 teachers have been prepared already at Guelph. Thirty-three schools have gardens this year. Of these Kent has 6 and Elgin 3. So you see that your district has a good proportion of those school gardens.

For this year the Department has apportioned $4,000 to encourage this work. Any school in this county that wants to take up the work can share in this appropriation.

To further the work a series of school charts has been commenced. The first two on alfalfa and field crops are such that every pupil can understand them. The children will not need to go to a corn fair to learn about alfalfa. Next year 250,000 children in Ontario schools may be taught from these charts, if the teachers will turn their attention to it. The very best alfalfa seed that it is possible to buy is grown in Welland and Haldimand Counties. A week ago I bought a bushel of alfalfa seed of the very best quality grown on one of the best farms in Welland

County. I paid $14 for it. This will be put up in packets of 2 oz. each and will be sent to schools that will make use of it. It will be enough to plant one square rod of ground. I will send instructions to the teacher with it, and the children will plant and take care of it. Next year when it comes up they will have 1-160 of an acre of the best alfalfa that is to be grown. They will figure on it. They will see it grow. Inside of ten years from that little piece of land the alfalfa may be introduced into many farms. This is teaching Agriculture by the practical method. Such is the plan for teaching Agriculture in Ontario schools.

Another thing! It will pay you to pay your teachers well. It is a good investment. There is nothing so expensive as ignorance, nor anything such a good investment as education of a proper kind. We are only beginning to realize the possibilities of our schools. Here we have been trying to improve the corn cultivation through the farmers, but I believe in getting the boy and girl at it through practical studies that may be carried on in the schools..



A Modern Seed Corn Drying House.

IMPROVEMENT OF THE CORN CROP.

Prof. L. S. Klinck, Macdonald College, Que.

It looks as though corn were still king, judging from the interest shown here. For the past two days we have been spending considerable time in discussing corn and the methods relating to the harvesting, storing, curing and grading of the corn, and at the same time conducting open conferences in which anyone who has questions to ask on this subject had an opportunty to ask for information. While we are attaching a great deal of importance to this phase of the subject, the matter we are most concerned about is that of learning more about the corn plant and the seed itself. It will not do for us to overlook the fact that the management of the land is also very important.

The subject I am to speak on is the question of rotation and tillage in relation to corn culture. Corn has been attracting more and more attention, not only from

the standpoint of the production of grain, but from the standpoint of the man who is interested in growing corn for silage purposes. The amount of corn used for ensilage has increased 25 per cent. in the past few years.

The successful growing of corn requires that attention be given to three things: The first important point is to get good seed of a variety that will do well in the district where it is grown. The second is the manuring of the land where it is to be grown; the third a proper rotation of crops.

While we have been emphasizing the seed end of the question—for that is very important—the man who overlooks the equally important questions of good cultivation, good manuring and good rotation will not be able to keep up a very high level.

To a very large extent, improved drainage will increase the productiveness of these counties, Kent and Essex. Naturally, corn will not thrive in cold, wet soil, and, if it is not possible to get on the land early in the spring, the crop is in great danger of being frozen before it has had time to ripen, so that improved drainage not only increases the yield but also improves the quality of the grain by lengthening the season. Wherever the land can be drained with us we find that we are repaid in a very few years for the expenditure.

In selecting land for corn, for grain or for ensilage, we choose the warmest, driest and sunniest fields that we have. If a man has one-third or one-quarter of his land in rotation, in which he grows mangles, turnips and potatoes, he will naturally have some part of it corn.

Now corn is not a good forager. If you allow a few grains of oats or wheat to fall into a piece of land that is poorly cultivated you will find that they will grow up and flourish, but if you drop a few grains of corn in the same way, if they come up at all, they rarely grow any higher than the oats and are so sickly that they are not able to reproduce themselves. We must put corn on rich and well prepared land, and it must be well cultivated if we wish satisfactory results. Corn being a good feeder and a poor forager, requires a good collection of land and good cultivation. I overheard a man say that he had grown corn after corn on a certain piece of land for twenty years, and that it is yielding as well now as ever. If that man has done nothing to return to the land the fertility which he took from it, he either has an exceptional piece of land or else he has lost a great deal more than he is aware of.

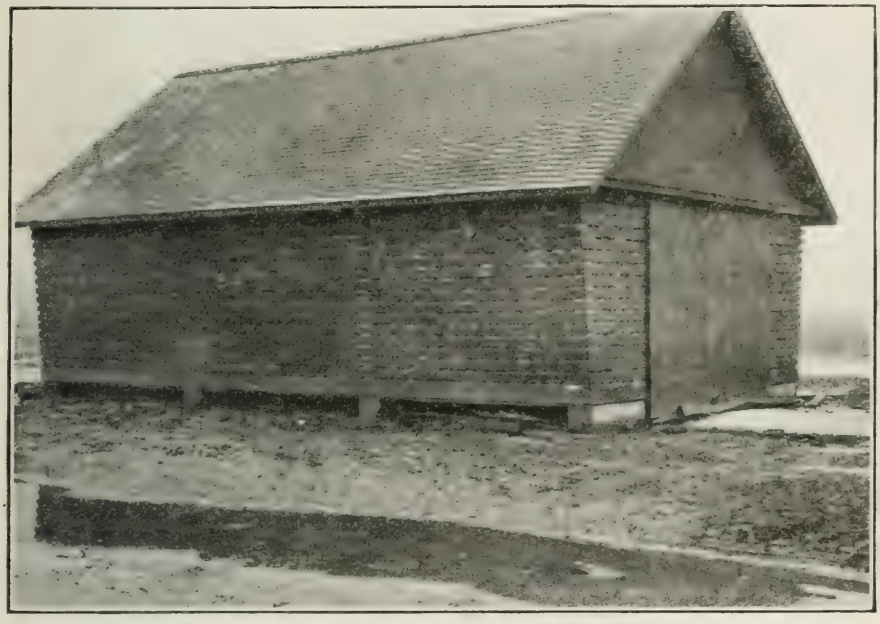
An experiment was tried on prairie land where corn was first grown in 1879, without clover or manure. This land at first produced 70 bushels to the acre. After corn succeeding corn for 13 years the yield fell from 75 to 35 bushels to the acre, and 16 years later, after 29 years of successive corn growing on the same land, the yield fell to 27 bushels to the acre. On the same farm at the same time a rotation was followed where corn followed oats. In 13 years the yield fell from 70 to 62 bushels per acre, and at the end of the 29 year period the yield had fallen to 46 bushels per acre. A similar experiment was tried when a rotation was followed of corn, oats, and barley, the result being that the corn yield fell from 70 to 66 bushels in 13 years, and had fallen to 58 bushels per acre at the end of the 29 year period. We here see that rotation of crops without any manuring keeps the yield up much higher than when the one crop is grown continuously on the same land. The continuous corn growing shows the necessity even in rich soil of rotation of crops.

On over 1,000 farms, representing all the Provinces of the Dominion, it was found that the crops on only about 12 per cent. of the farms were being rotated.

In some districts the farmers seem nearly all to follow good rotations, while in other districts the farmers do not seem to know anything about it.

We like to rotate our crops because the different crops feed at different depths and at different times. Barley is a shallow feeder. Oats feed deeper, and corn feeds still deeper. One reason why we like clover is that it feeds at a greater depth, and also brings up the mineral elements and leaves them near the surface to help the succeeding crop The clover roots also open up the sub-soil and make it possible for the water and the air to get in better. What is needed is an equal distribution of fertilizer, so that the plants will occupy the greatest possible area.

Let me leave this thought with you. That if you take a crop like barley it is early put in and early taken off. Now when that crop is taken off, the land is still in shape for work. The plant food must still be in an available condition,



A Modern Crib.

The double crib, with a covered passage way between, is economical and a most satisfactory way to store ear corn.

and as there is nothing to take up the food it is left in the soil. Two crops, turnips and rape, grow late into the fall and are both great feeders. We find that these crops will do best after barley.

We always prefer to have the corn following clover, and our ensilage corn is put on clover sod. In doing that, we are governed to a considerable extent by the condition of the land itself. We do not put corn on the dirtiest land we have. If we do, we make preparations to get the weeds out. If the land has couch or blue grass the hay crop is taken off and the land plowed about 3 in. deep with a shallow field plow. Then, after that, we go over it with the heavy roller. That is to make it possible to conserve moisture for the seed to grow. I sometimes think when the old spring disc harrows have gone from the field leaving it looking that rough the farmer must feel some satisfaction in making it look as if something had been done.

In regard to the application of manure, we prefer putting about 20 tons to the acre in the fall. When the manure is put out in the winter it is put in large piles about 16 or 20 feet apart. It freezes, and in the spring, when it is beginning to thaw, we go over the field and knock over the piles and spread it as soon as we can. That makes it possible to have all the manure on as soon as the land is fit to be worked for corn. If the manure is well rotted, the corn is put in with the discs. I believe in many sections the practice is still followed of leaving the corn land in sod until the spring, especially if it has been in clover. We follow that practice nearly every year. We must have some land for pasture for our cattle during the late fall, and we can accomplish this by leaving the clover until the 15th of May, when it is plowed under as manure. That works very much better on sandy land than on clay. We have considerable difficulty in getting heavy land ready for corn. We find that where the season is short, the plowing under of the clover has a tendency to keep the corn growing too late in the season. I have spoken of but two kinds of fertilizer, rotted barnyard manure and clover.

Whether the land is plowed in the fall or spring our experience has been that it pays to put a great deal of work on it before the corn is put in. A number of times I made the mistake of putting in corn after a heavy rain. The soil was too wet and too cold and the corn grew very slowly. Later it made up for its poor start, but another piece which was put in about ten days later overtook the first at the end of two months and remained decidedly in the lead until the end of the season. I mention this because it is often suggested that we should put corn in when the time comes, but I say—put it in when the weather and land are ready.

Many people in the Eastern Provinces, Quebec and New Brunswick, are anxious to grow corn. For Quebec we need good, well-matured corn which always ripens early, say about the middle of September.

With regard to the different strains, you have all seen the results of Professor Zavitz's work on the question of selecting seed grain, and how, through his work, some varieties have produced larger yields per acre. We are laying emphasis on such strains as Early Leaming. We advocate very strongly well-filled ears. Professor Chamberlain's plan for selecting seed corn in the ear is a good one.

One of the objects of this convention is to acquaint people with the make-up of a good ear of corn. When I am judging corn at this Exhibition I ask myself these questions: Will it grow? Will it yield? Is it of sufficient quality to answer my requirements and does it show any advanced breeding? Corn that will answer these requirements will call for no apologies.

At Macdonald College we plant corn for grain in hills about 36 inches apart, and four kernels of tested corn to the hill. In corn growing there is a good deal of loss through cultivation. You often lose as many as two plants from a hill. We find that to plant four grains there will still be sufficient, but the most satisfactory results come from three stalks to the hill. Some of our men plant the corn so thickly that very little of it will ripen.

Corn for ensilage gives the best results when the rows are 42 inches apart and the stalks 12 inches apart in the row. If it is cultivated before it is up, it is wise to put in considerably more seed than is needed. There is no reason why it should not be cultivated before it is up. We sometimes roll it and always run the harrows over it before it is up. This helps to keep down the weeds, and by running the harrows crosswise over the fields it helps to conserve the moisture. After the corn is up we cultivate it with the cultivator once a week. During the last few years we have tried the plan of going through the field with the one-horse cultivator after the corn is too high for a two-horse cultivator. We prefer the corn

cultivators with narrow teeth, as they leave the land more level and conserve more moisture. These small cultivators can be used for a long time after the ordinary two-row cultivator would destroy much of the corn.

We must conserve the moisture. It takes 270 tons of water to produce a ton of dry matter in corn, so it is necessary to conserve the water in the soil so that it will be ready for use when it is most needed. The essential in rotation and good cultivation is to have moisture and plant food in an available form. We must make conditions favorable for the preservation of moisture in the soil. More clover and better cultivation are the very best means through which this can be obtained.

Several years ago the people cultivated the soil to keep down the weeds. This was good in its way, but we are past that stage. We now cultivate the soil for cultivation's sake. We know what cultivation will do to liberate plant food. The successful cultivation of corn taxes the intelligence more than the cultivation of small crops. For corn we must prepare the land well and cultivate it intelligently.

In this part of Canada you have the soil and climate for the production of excellent seed corn. You have men who are interested in the subject, and you will, in a very short time, if you are careful in sending out a good article, be supplying the seed corn for the great majority of the ensilage growers throughout Canada.

AN OLD LOG CORN CRIB.

A few of these can still be seen. They answer the purpose fairly well if the crib is not too wide and the logs too large.

ALFALFA AS A SOIL BUILDER.

PROF. A. E. CHAMBERLAIN, DEVELOPMENT COMMISSIONER, GREAT NORTHERN RY., ST. PAUL, MINN., U. S. A.

Alfalfa is a big subject, but soil fertility is even a bigger subject. We know that man is naturally a soil robber. The fertility in the soil is like the money in the bank. If you keep on drawing you soon have your account over-drawn. We

have noticed in every country where the farmers have continued to take from the soil without feeding it in return, that bye and bye it ceases to give good results. We have a number of panaceas at the present time for maintaining the fertility of the soil. Some of these are real and some are not. Crop rotations give better yields. If one year a farmer plants wheat, then barley, then corn or potatoes, by that method of farming he gets better results, but rotation of crops is not the invention of scientists but the will of nature.

In our country where corn is planted in the same field year after year an enemy to the corn plant appears, the corn root louse. These go to the roots of the corn plant and cut them off. If you go through the corn states of the United States you will often find poor crops. The reason is that the farmer has neglected to rotate his crops. Still you may grow corn, then wheat, then potatoes and thereby rotate your crops, and yet be robbing your land. Unless you are feeding the land, and bringing back the manure, you are carrying on soil robbery. The bigger crop you get, the more you rob the soil. I wish we could see more dairy herds, more clover fields, and more alfalfa, and more of the products of the field fed on the farm. Some of you do not notice the change that is coming over some sections of this country because you are so often over it. But there are many farms throughout this district where the land is redder and lighter than it was 20 years ago. That means that these farms are being robbed. The normal soil is black because of the vegetable matter and grass roots and brown leaf mould which it contains. When the soil gets lighter in color take warning. It will soon refuse to produce. The history of Agriculture tells us that unless the farmer feeds the soil, in proportion to what he takes from it, it will soon refuse to feed him. Sicily once paid a war debt of 25,000,000 bushels of wheat and this loss to the country has left its impression on the soil to this day.

The average yield of wheat in America used to be 15 bushels per acre and now it is about 30 bushels to the acre. The farmers have begun to take notice of the laws of nature.

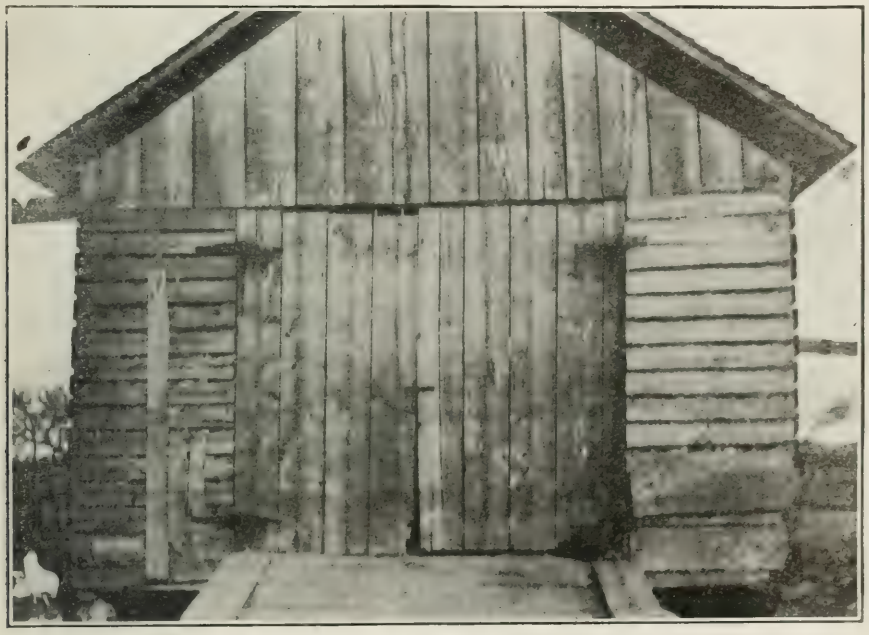
I am going to talk on alfalfa because it is a great soil builder. A plant that reproduces itself by seed in a pod is called a Legume. Clover is a Legume. Plants of this family, alfalfa, clover and peas, have a peculiar root formation. On the roots of these plants you find little warts that are filled with thousands and thousands of microbes. These microbes have the power to draw the nitrogen from the air and leave it stored in the earth. Legumes had grown wild all over the world until 1885 or 1886 without anyone discovering that the warts on their roots gathered nitrogen from the air and stored it in the earth. In 1886 a German scientist made this important discovery.

Alfalfa is an old crop. We are told that in the valley of the Nile it was grown as a crop 500 years ago. We find that dry soil is its native element. Do not try to grow alfalfa on poorly drained land. In our country alfalfa roots have frequently been found 30 feet in length and sometimes over 50 feet in length. Alfalfa yields better year after year when once you have a good stand. Pick out a piece of land that is rolling if you can for the worst enemy of alfalfa is a condition such as you have on your fields now. When we have a fall of snow which partly melts and then freezes over the fields it is very likely to kill the alfalfa and clover. A heavy rain in summer is also bad for the alfalfa.

Soil should contain a considerable quantity of humus, because it holds the moisture better. Eight ton of manure to the acre will help the land greatly by increasing the humus and thereby improve its waterholding capacity.

The seed bed for alfalfa is very important because the seed is expensive. If you did not see the seed growing send a sample to the Agricultural College for a weed seed test. Dodder is one of the worst weeds in clover. It comes up in clover and alfalfa and grows vine shaped around the clover stem. It has a sharp point and pierces the clover or alfalfa stem. Then it supports itself from and feeds on the clover or alfalfa plant or whatever it has attached itself to, and soon spots of your crop will turn out brown.

When getting your seed pay particular attention to where it was grown. It does best under the climatic conditions it was accustomed to. If you take a tree from here and plant it in Texas and take one from there and plant it here, they will likely both die. They are not used to the conditions. It has been so with alfalfa. Some alfalfa is grown under such conditions. I have known men in Minnesota to have threshed 15 bushels of alfalfa seed to the acre. Be sure when you buy seed that it has not been grown further south than your own latitude.



BADLY VENTILATED.

Boards for siding too wide; space between too narrow to admit of free circulation of air. The result is that the corn cannot dry properly in the fall and the germ is injured through the winter by the frost.

The next proposition is to make proper seed bed. Make it the best one you ever made in your life. In our country we often notice that the women will grow more crop on ¼ of an acre in the garden than the men will grow on two or three acres in the field. Did you ever think how the garden was prepared? When it is ploughed, it is ploughed much deeper. You drag it over and over. You keep on cultivating it and have tramped it again and again with the horses. These combined are what produce the results. The farmer who waits for rain to start his crop is not the best kind of a farmer. With proper conditions the farmers can have the moisture anywhere he likes. If the seed bed is made properly the soil moisture will be so controlled that the soil will always be moist to receive the seed

as it is the moisture drawn from the sub-soil that produces the crop. You may have the moisture anywhere you like; 2, 4, or 6 inches from the surface.

When you light the coal oil lamp in the evening, the flame burning absorbs the oil from the wick. The oil is conducted through the wick from the bowl below. But if you put in a new wick and light the lamp without first putting the wick in contact with oil, the wick will burn but there will be no oil in the flame. You all know that to get a good light you must first dip the wick into the oil. It is a law of nature that if you put a dry porous substance above a moist one, they both will share the moisture. When we get a big rain the moisture goes downward until it reaches the water table. Then it comes up through the pores of the soil just as far as you have a proper conductor for the moisture. After being plowed the soil should be well cultivated and harrowed as this makes the particles of soil fine and packs them closely together. This gives the most favourable condition for the rise of water for the crop from the subsoil, and by keeping the soil cultivated very shallow on the surface the loss of moisture by evaporation is reduced to a minimum and soil conditions are made most favourable for plant growth. The quantity of seed required to the acre depends upon many things. If sown broadcast on a well prepared seed bed 15 to 18 pounds to the acre should be sown, but if the land is poorly prepared you will need 20 to 25 pounds per acre. If you sowed one pound to the acre and it all grew it would be too much. This shows what seed we are wasting. The best way to sow it is by a grass-sowing attachment on the seed drill. The best seed bed for alfalfa in our country is where potatoes or corn grew the year before. Go over this with the discs and work up a mulch in the fall as soon as you can after harvest. The next spring keep the weeds down until about the 20th of June. Then plant about 18 pounds of good seed to the acre. If you have sandy loam plant deeper than you would in clay. In our country we plant it deeper in light soils and shallow in heavy soils. When the plant is from 4 to 6 inches high take the mower and cut it off two inches from the ground. Keep it down in that way all the first year. You can get a good crop of the alfalfa the first year but by mowing for hay then, the stand is injured.

That reminds me of a story I heard about a farmer in Illinois. It was reported that he was intending to plow up his field of alfalfa. A neighbor went to see him about it and found him tearing it up. The neighbor asked him, "Why are you doing that? Wouldn't it grow?" "Yes, it did nothing else." "But isn't it good hay?" "Yes, splendid, I thought I was boss of this farm but I can't be while this stuff is here. I promised the boys that we should go fishing on a certain day last summer, but when the day came around we couldn't go because we had to cut this alfalfa. Then I promised the boys that we should go fiishing on the 4th of July, but when the 4th of July came we had to cut the alfalfa again. Then I promised them we would all go to the Fall Fair, but I'll be hanged if that alfalfa didn't have to be cut again. I say that I am going to be boss of this farm so am plowing it up." This is a slight indication of how alfalfa grows.

It is worth while to put it in carefully, for a field of it will last you as long as you live. Do not use it for pasture except for hogs! Give hogs alfalfa pasture and they will gain as fast as if they got milk. Give them corn with it. The Agricultural Colleges have tried it and have had great success.

Q.—Do you think that alfalfa will interfere with the underdrains?

A.—I do not think that it will.

Do not pasture it the first year with hogs. Sheep are very hard on alfalfa and will bite the crown off the plant. Cattle will bloat on it, in this altitude. It is a

hay crop, a hog pasture crop, and a chicken crop. When you cut it for hay cut it at the time when about one tenth of the plants are in bloom, just when you see the color of the flowers. The reason is this. When the alfalfa plants get to that stage of growth they start the next crop from the bottom. If you cut it then, it will not hurt the plant but if you wait longer the new crop is harmed. It can be cut three or four times a year here according to the season. Always leave a little head on the top so that it will protect it in winter.

I warn the farmer against poor stock. It costs under your conditions from $80 to $100 to raise a horse on your farm. I believe a number of you raise colts that when three or four years old are not worth more than $125.00. Others raise colts worth $250.00. Some of you have cows producing 150 lbs. of butter a year while others have cows which produce 600 pounds. I believe that it is because of these poor farmers that the boys leave the farm. The boy wants something that other people admire.

A Poor Excuse.

The use of this type of crib is justifiable only in years of bumper corn crops. Corn from this type of crib should never be used for planting.

Many of you want to win a red ticket for corn. I believe that the corn that will win next year will be grown on clover or alfalfa soil. Alfalfa is not a rotation crop but red clover is. If you feed alfalfa on the farm it is a great soil builder. It is often found that the land has to be inoculated with the Legume bacteria before it will grow alfalfa. But we have never found a place where sweet clover grows well that alfalfa cannot be grown without inoculation.

In the United States we find that where barley grows well inoculation is not needed. Do not try alfalfa on undrained or sour land. You may sow it with barley and get a splendid stand but the greater chances are that it will heave during the winter.

I wonder what will be the results of this meeting. It depends on the farmers,

whether they go home and do something better than they have been doing. If you do not try you have wasted your time here. That is why everybody here in connection with the show have done their best—to see if you will not try to do your best. You talk about drudgery. That is labor without brains, that is all. When you do your work without using your heads you are drudges. Some of you go to the store and buy your wife a calico dress. She will take it from you with a tired look on her face and the next day the meals will be late because she is busy making her dress. But if you buy her a pretty dress and a pattern then you will see her smile. She will get up early in the morning and will get you a good dinner. Why? She has her head and heart in the work. When you go out to your work try to do better work and to make better homes.

Some of you young men live in the homes that your father made and left to you. Are you taking care of them? Some of your homes have not been painted. The farm is going to wreck. Oh, do not let them continue so. Make them better because you have been there. Modernize your houses. You Canadians have no business to buy more land until your house is improved. Make it better. Do not go into debt. The size of the house does not make the home. You can take good young men and women and set them out in the desert and they will make good homes. You cannot buy a home. You must make it. If ten of you would make better homes because of what I have said I would be well repaid, but you may think this is none of my business. The making of the home is not your responsibility, nor your wife's, nor the responsibility of the boys and girls—it belongs to the whole family. *Make Better Homes.*

BINDING SECT. AUG 24 1967